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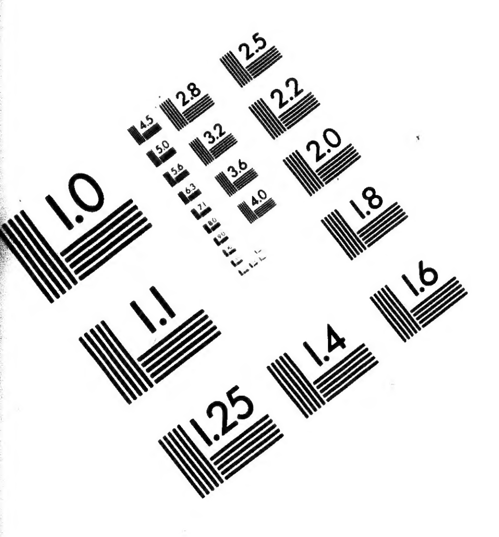

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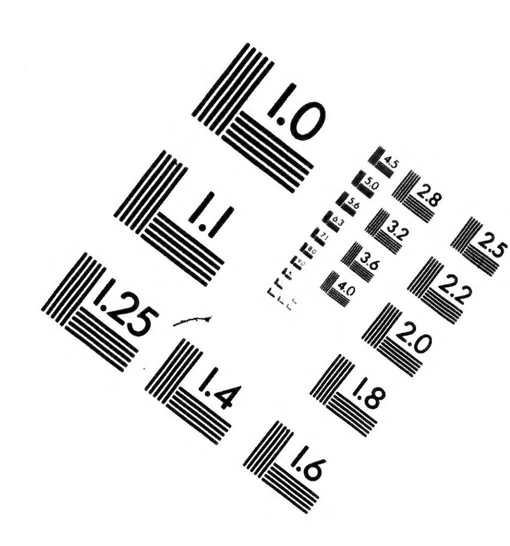
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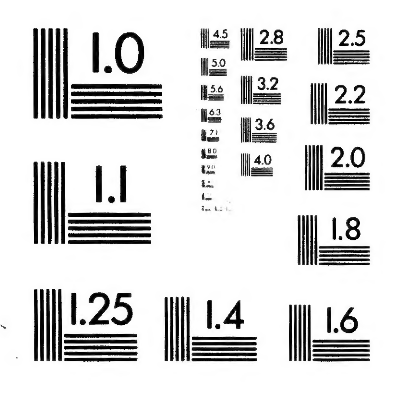
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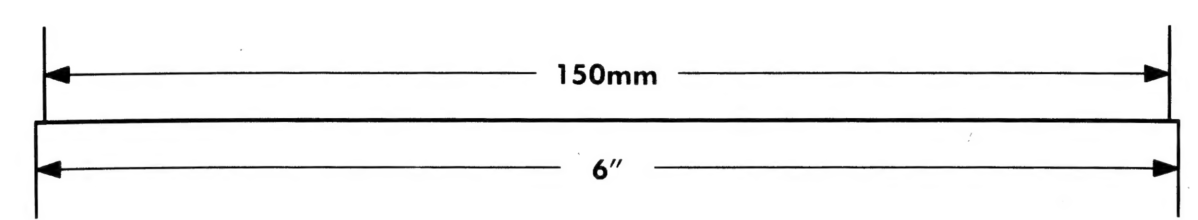
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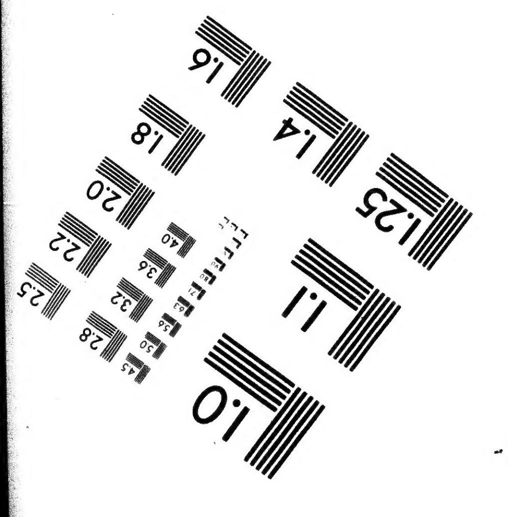
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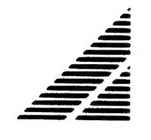












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MANUALS OF THE HISTORY OF ART

ARCHITECTURE

Antiquity

By

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Illustrated by 148 Engravings, 13 Maps and 997 Diagrams

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INTRODUCTION.

Of all the arts, the history of that of building is the one most difficult to write within the limits and in the sense of a manual. Since it is universal, it must have reference to that of civiliqation and of the mechanical sciences, as well as to geology, geography and climatology; it also comprises a considerable amount of technical explanations.

A clear sense of the necessity for reducing the matter to its essentials, and to introduce method in the compression, clarity and conciseness in explanations, have determined the conception of our undertaking, the extent of the inquiry, the arrangement of its plan, the method of analysis and the deiting.

However disproportioned the extent of this work may be to the enormous size and the complexity of the subject, we believe that nothing important has been omitted, and that the latest discoveries are included. Likewise the bibliographical notes for each section will aid access to the sources and to special studies.

We are ambitious to be useful to "laymen" as well as to professionals in furnishing to both classes of readers a kind of information, whose acquisition is as difficult as indispensable, in the present condition of artistic literature.

First we have endeavored to render accessible that knowledge of construction, which is so rare and without which it is impossible to fully appreciate the character and the beauty of an edifice. To succeed in this, we are compelled to explain much and to avoid all professional terms.

As for the architects, whenever we show how the product of a school has resulted from the place, the time and the purpose, we have especially regarded the interest to be found by them in meditating on these instructions from experimental e esthetics.

Our work has properly been substantially analysis and demonstration, excluding not only statements of personal "impressions" of no concern to the reader, but likewise descriptions interfering with the sequence, and also forbidden by our narrow limits. Moreover these are largely replaced by illustra-

illustrations. In return we have taken up chronology and monumental topography, because their determination is not always easy, and they are indispensable to the perception of relations and affiliations.

Our method must first be analytical; yet its aims are decidedly synthetic.

On the one hand, it adds to the usual definition of forms and states the explanation of structures and of functions, a and for a simple confirmation of the results, the statement of the conditions and the mode of obtaining them.

On the other, it admits of a desire to see entirely and fully how the means are always related to the aims, the diversity of the schools to the writing of the art, and the particular reality of artistic phenomena to the general idea of the esthetic law controlling them.

Besides, this tends to a presentation of the history of architecture in a dramatic form, so to speak; that of an immense effort of the different races of men and of successive generations to overcome the resistance of nature and the insufficiency of material and technical resources by the solution of problems proposed from the beginning.

To favor comparisons and make more evident changes and progress, as well as the laws controlling the art of building, for each of these elements has been reserved a symmetrical place in each section.

Corresponding to a historical unit, each section regularly comprises two inquiries in addition to its location in time and place, together with the determination of its rank in the entire series.

The first relates to the conditions on which depend the beginning and the bearings of the art of building; on the one hand, the human conditions -- relatiwe importance, the modal character of the requirements, whose schedule is equivalent to an inventory of notable monuments; national temperament, external influences, intervention of individuals, the state of science and of mechanics, the organization of the work -- ; on the other, the physical conditions, nature of the ground, climatic periods, resources in primitive materials.

The second institutes three analyses.

Two of these relate to the useful part of architecture, the object of one being the preparation of the programmes and their realization, that of the other treating of construction, considered in its materials and methods, the structure of the wall and of the isolated support, as well as the mode of covering.

Finally the third concerns the agreeable element of the art, defining the energy, quality and nature of the effects; it d distinguishes those of harmonious order from those merely picturesque, those of monumental sculpture from those of ornamentation; it enumerates the usual motives and characterizes the style.

Like the text, the illustrations are to be didactic.

The selection of the engravings is guided by the desire to exhibit all typical aspects.

As for the very numerous sketches, they are not intended f for artistic effect; their purpose is to make evident to the eye the characterizations and the classifications presented to the mind by the text.

The division of this work into three volumes, one being devoted to antiquity and the others to the middle ages and modern times, corresponds to an actual division of the course of architecture. There may indeed be distinguished two stages, the first being characterized by confinement to a restricted area -- Asia in Mesopotamia and nearer, Egypt in the basin of the Mediterranean, with a relative unity of location, a dry and warm climate, scarcity of wood, with customs more or less oriental; the second having a variety of natural and human conditions, that cause the extension of the art of building into regions cold and wet, cloudy and forested, with the intervention of new races and religions.

As indicated by the adjacent diagram, the arrangement of this volume reflects the development of the primary phase of this evolution.

The four books into which it is divided correspond to:--

The first to a long and laborious infancy, contemporaneous with the neolithic age of mankind.

The second to an advance in the ancient Orient beginning at

the middle of the fourth millenium -- first and substantially in Egypt and Mesopotamia, then in the Hittite and Phoenician countries and in Canaan.

The third to a flowering existing in the Egean region (Archipelago, Greece, Western Asia Minor and Etruria), from about the 14 th century B. C. to the 3 rd century A. D. in two periods, at the Creto-Mycenaean epoch and the Prehellenic and H Hellenic times.

The fourth to two later productions derived from the preceding, those of Persia of the Achemenides, and of the Roman world.

January. 1911. Francois Benoit.

BOOK I. PREHISTORIC ARCHITECTURE.

1 Not before the close of the glacial period was realized an economic and social state propitious for a rough sketch of architecture.

So long as the rigor of the climate had condemned him to the nomadic and precarious existance of the hunter, man was satisfied with an accidental shelter in a cavity of the rock or under a hut of brinches; he took no thought for burial and his religious practices were fulfilled at the bottom of a cavern, whose walls were ornamented by forms of animals or "totems" painted thereon.

But as a result of the milder temperature, a settled and a agricultural life, by increasing and regulating the means of subsistence and by a prosperity creating needs, had determined the density of population and a political organization, without which could be no collective and trained labor, so t there was both a necessity and a possibility of architectura, undertakings. The more so, that to material progress corresponded moral advances -- beliefs producing rites, the conception of another life in the image of the terrestrial -- which introduced a demand for temples and tombs. Indeed from that distant epoch, termed neolithic or of polished stone, there remain some vestiges of habitations on land or lake, fragments of earth fortifications, tombs, -- artificial grottos, cists, dolmens, covered passages, -- and finally monuments undoubtedly religious, -- menhirs, cromlechs and lines.

At the same time and favorable to the progress of art occurred a commercial traffic increased by a transfer of ideas and of inventions.

Thus in the course of long centuries was formed a rudimentary architecture, common in various degrees to all the buddi-
2 ng civilizations of the ancient world, from the Atlantic to
the Pacific, and from Scandinavia to the Soudan.

I. Monumental Chronology and Topography.

Too many milleniums, too many revolutions, too many improvements have succeeded each other, opposed to the duration of the poor and frequently fragile attempts of this infency of mankind, to make possible an exact limitation of the domain of neolithic architecture.

At most in the present state of knowledge may be noted that the area of prehistoric dolmens -- whose relationship appears incontestable -- forms an elongated zone from Ireland, Brittany and Portugal even to India and Japan, including in addition to the countries mentioned, England, France, Spain, North Africa, Scandinavia, North Germany, the Balearic islands, Corsica, Southeast Italy, Malta, Bulgaria, the Crimea, the North coast of Asia Minor, Syria, Southern Egypt, the Egyptian Soudan, the Caucasus and Persia. Certainly these different countries appear very unequal with regard to the abundance and importance of the monuments. The richest belong to Western and Northeastern Europe. At the head is placed France, divided into :-- Normandy -- the covered passages of Fontenay-le-Marmion (Calvados); the Anglo-Norman islands -- the dolmen of Ancresse on Guernsey; the Paris basin -- passage of Justice at Presles, artificial tomb grotto of Jouy-le-Comte (Seine et Oise); Champagne -- crypt of Mizy (Marne), caverns of the valley of Petit-Morin (Epernay); the West -- covered passages of Bagneux near Saumur (1), of Bournand near Fontevrault, dolmen of the forest of Boixe (Charente) etc.; the Southern borders of the central plateau -- dolmen of Livernon (Lot), cromlechs of Can-de-Ceyrac (Gard), covered passage of Colloroues (Uzes); in the Southeast -- grotto of Fairies northeast of Arles, dolmen of Bragnignan; the Southeast Pyrenean-dolmen called Caxa de Roland at Arles-sur-tech (eastern Pyrenees); Corsica AA dolmen called Stazzona de Fontanaccia near Sartene; but especially Brittany, particularly in Morbihan a and Finisterre -- lines and passage under the tumulus of Mont-Saint-Michel at Carnac, Fairy stone and dolmen of flat stones at Locmariaquer, menhir of Plesidy (Cotes-du-Nord), cromlechs of Er-Laric (Morbihan), covered passage of island Gavrinis (Morbihan) etc. In the second place fall the British Islands, thanks to the monuments of Scotland; of England -- cromlechs of Avebury, east of Bath, and of Stonehenge, north of Salisbury; of Wales -- dolmens called Arthur's Stone in the peninsula of Gower near Swansea and of Penter-Ifan in the county of Pembroke; of Ireland -- covered passage of New-Grange near D Drogheda etc. Likewise lengthy is the inventory of the neol-

megalithic structures of the Iberian peninsula, particularly in the north of Portugal -- dolmen called Lapa dos Mouses near Ancora, and in Spain -- covered passages of Antequara north of Malaga, and of Los Millares near Almeria. Also for Denmark, Schleswig and Holstein -- tumulus of Urby; for Sweden -- covered passage of Karleby; for Germany, etc.

Remains of huts on land exist in Germany -- settlement of Grossgartach east of Heilbronn; in Hungary -- settlement of Lengyel (county of Tolna); in Bosnia -- settlement of Butmir (east of Serajevo); in Greece -- settlement of Orchomene; in the Archipelago, etc., etc., while remains of lake dwellings are yielded by lakes in southeast France, Switzerland, northern Italy, southern Germany and Austria-Hungary.

It indeed appears that for the neolithic period the eastern basin of the Mediterranean was the location of a focus, whose rays were felt toward the West by way of the sea and toward the North by way of the Danube, the Moldau and the Elbe. This in nowise excludes the idea of original development in other adjoining countries, in similar conditions and with approximate results, yet inferior by reason of less favorable circumstances. Moreover, let us not forget, that in this Chapter chronological exactness is not less difficult than topographical. Not only are lacking assured data, but we also risk being deceived by the persistence of the methods and procedures of the neolithic period during the historical period, even to our own time among peoples either little gifted, fated, or outside the currents of civilization.[1] Referring to the more prudent computations of chronology, the passing of the prehistoric phase to the protohistoric period of architecture may be provisionally placed for Egypt at about the middle of the fourth millenium B. C., and for Crete some centuries nearer us.

Note 1. Compare the persistence of the dolmen among the Hovas of Madagascar and among the Khasias of Assam.

II. Programmes and their realization.

The dwelling of the neolithic man commonly consisted of a small hut, rather circular than square, and partly excavated in the earth. The progress of civilization gave rise to a

rough arrangement, distinguishing between a kitchen with hearth and ditch for rubbish and a sleeping room; this differentiation resulted according to locality in a division of the hut into two rooms separated by a partition -- that for use as a sleeping room having a raised floor -- or to several adjacent cabins.

The essential part of a prehistoric tomb is a space generally square or rectangular, sometimes circular or polygonal (3). Sometimes -- then receiving the name of cist -- it has the f form and dimensions of a chest; sometimes -- then being termed a dolmen -- it presents those of a more or less spacious chamber, that may have an area of from 43 to more than 754 sq. ft.; in height from 3.28 to 11.5 ft.; its entrance closed by a slab, generally movable and often pierced by a round hole; (3, XIVU; adjacent caves sometimes exist. The chamber is freequently preceded by a vestibule or rather a corridor, more or less long and wide, usually straight, but sometimes bent; on the island of Gavrinis it measures 41.0 × 4.3 ft. (3,XII); at Bagneux, 65.6 × 23.0 ft. (1); at New Grange, 101.7 ft.(3, IX; 7,9″). The entirety of a dolmen and an avenue takes the name of covered passage.

Rare are grottos,-- except in case of extreme softness of the rock -- denied to men whose tools were miserable; as examples we cite the artificial sepulchral grottos of the valley of Petit-Morin and those of Jouy-le-Comte. (3, XVI). More f frequently are covered passages produced by placing a covering over a ditch excavated in the earth or rock; such are the galleries of the Paris basin and those of South France, -- t the alley of Justice at Presles and the grotto of the Fairies near Arles being given as respective examples of the first a and second.(3, XIII, XV). But the normal type is a structure on the surface of the ground. Only like the galleries mentioned above, it was generally concealed by a hill of small stones, enclosed or not by a row of stones; such is the tumulus of New Grange, with its diameter of 377.3 ft., or again that of Mont-Saint-Michel in Brittany, with its volume of about 125,550 cubic ft. (3,XIIU. In the plain of Southern Europe, dolmens and covered passages are frequently surrounded by an

enclosure of stones set to form a rectangle.

The monuments of the neolithic period, whose purpose seems not sepulchral, have the erected stone as a chief element. Sometimes these are single -- termed a mennir 66 in the form of a spindle or obelisk; sometimes several are grouped, either in a circle or in rows, forming in the first case an enclosure termed a cromlech, or in the second, alleys termed lines. Two adjacent stones of a cromlech are sometimes connected by a transverse monolith; it also occurs that small alleys precede the entrances.

Mennirs particularly abound in Brittany; that of Plesidy m measures 36.0 ft.; the Stone of the Fairies at Locmariaquer, now overthrown and broken, extended to more than 72.2 ft., t that of Penmarch here shown (2) rises 24.6 ft.

Cromlechs are numerous in France, England, Sweden and Denmark; we cite as examples:- in the first of these countries, at Er-Laric a pair of tangent circles with diameters of 180.5 and 196.9 ft., and those of Can-de-Ceyrac measuring across 311.7 and 321.5 ft., with small avanues before the gateways; in the second, that of Avebury covering 1076000 sq. ft., and that of Stonehenge about 98.4 ft. across with two concentric circles. (4).

8 As for the lines, they are peculiar to Brittany; the plain of Carnac has three in a series extending from East to West for a length of 1.86 miles; they comprise from 10 to 13 rows containing a total of 2700 menhirs. Two of these are connected with a cromlech, as sometimes occurs.

III. Construction.

Very poor were the technical resources of builders in the neolithic period. They doubtless possessed the pick, axe, adze, gouge and saw (5), made of flint or of some other polished stone; but the defective cutting of these instruments e excluded the power of shaping at will stone or even wood. They could not think of cutting the former, being satisfied with roughly reducing it by breaking off pieces by blows. There was likewise forbidden to them the freedom of execution r required by the simplest framing in carpentry.

Yet by patience, ingenuity, time and trained joint effort,

they acquired a relative power. Thus they knew the method of drilling or of sawing hard materials by subjecting them to the abrasive effect of grains of sand moved by rotation or
9 alternation; the practice of splitting stone by strongly heating the location of the desired split, following this by sudden cooling.

For transportation, sometimes to distances of more than 18.6 miles, for hoisting an setting enormous blocks having a weight sometimes of 4.45 to 5.58 tons or even of several hundred tons, they must replace the lack of mechanical means by the employment of thousands of men and by the artifice of progressive movements by the aid of the combined operations of embankment, excavation and swinging. (6). For example, their succession that produced a dolmen or covered passage was conceived as follows; first, the raising of the stones forming the lateral supports; second, the complete burial of these monoliths in the mass of an artificial hill extended in a gentle slope, a process with the double purpose of staying them and forming a means of access for the covering slab, then setting this in place; lastly, the excavation of the interior, or the total uncovering, if the programme did not comprise a tumulus.

Necessarily, wood and earth were the first materials utilized, and they continsed preferable for domestic structures; a hut was built of wattles covered with mud; a lake dwelling comprised only logs bound together with cords.

Toward the end of the period, at least in Eastern countries, Egyptian and Egean, appeared the use of unburnt bricks and of stone, the latter forming the indisbensable foundation for a wall of clay.

For mounmental purposes were employed only stones. These were selected as large as possible, to reduce the labor of cutting to a minimum. The height always and sometimes the
10 width of a wall was composed of a single block with dressed surface and slightly inclined toward the interior. It was l likewise fortunate to cover a chamber with a single slab (7, 9); some exist as at Bagnieres, whose area exceeds 538.2 sq. ft. (7,II). Naturally the rough dressing of the stones was economically limited to their visible surfaces.

Yet doubtless by means of technical improvements, the builder in the last epoch of the neolithic period could reduce t the dimensions of his materials. Progress was at first limited to the supports, which became a pile of large stones, the crevices being filled with small stones and earth, the covering continuing to require excessive slabs; for example, this is shown by the passages of the "alleys"of Fontenay-le-Marmion, of Collorgues etc. (7, V). Then occurred, as proved by the "chambers" of Fontenay-le-Marmion, of Collorgues, New Grange, Los Millares etc., the invention of corbelling out the courses, permitting the reduction of the openings and conseqently of the covering slab.(7, IV).

IV. The Effect.

Without mentioning the necessity occurring in many cases to devote the entire art and skill to the solution of the problems of construction, the architecture of the neolithic age w was almost outside the stage of pursuing properly esthitic a aims.

Most effects were denied to it; that of the orders by the fatal meanness of the programme; that of the movement of lines and of masses by the use of monoliths, that of the contrast of solids and voids by the forced timidity of construction; that resulting from the intrinsic beauty of choice materials by the difficulty of transportation; that depending on perfection of cutting by the insufficient tools, which for a still stronger reason excluded sculpture.

Alone were permitted to it and yet in slight measure, those produced by large dimensions and the application of adventitious decoration. We have noted, that it sought the first; as for the second, it required either engraving, specimens of w which are presented by the stones of Gavrinis and of New Grange, (8), or formless sketch reliefs, such as are seen in the tomb grottos of Champagne (3, XVI), or lastly, application of colors in the style of those showing traces at Grossgartach.

The motives are geometrical fancies, especially repeated w wavy lines and symbolical hatchings; exceptionally coarse representations of the human figure.

In summation; however rudimentary it remained, neolithic a

architecture realized all the progress permitted by its exclusively stone tools, and it endowed mankind with the essential elements of the art of building; formulas for the preparation of tamped earth and the making of bricks, processes for stonecutting, methods for raising and transporting the heavier masses, the framing of wood, and the expedient of corbelling.

12 BOOK II. ARCHITECTURE OF THE ANCIENT EAST.

We present together the architecture of Egypt, of Mesopotamia and of nearer Asia (Hittite, Canaanite and Phoenician), because they all belong to the same historical period, to the same stratum of civilization, and their influence relations unite them.

It has seemed proper to place in a first Part the great elder styles, the beginners that broke the paths.

Tradition commences in Egypt a history of architecture.

In truth, there are strong presumptions, that to Mesopotamia belongs the honor of the beginning. Particularly the fact, that several things common to the architecture of Mesopotamia and to that on the banks of the Nile during their early stage were then retained by the former and abandoned by the latter,[1] leads one to think them essential to the first, being its own invention.

Note 1. Such as to construct exclusively with bricks and to realize relief on the walls by means of alternating pilasters and recesses.

Very well, if our knowledge of its productions equaled that of Egyptian monuments possessed by us, the architecture of M Mesopotamia would doubtless be accorded a right to preeminence superior to what constitutes chronological priority; for it holds the originality and the efficiency of several processes, as well as obligations more or less on all later schools, comprising the Western and the Modern.

However, in the uncertainty of the science and likewise the advantage possessed by the Egyptians over the Mesopotamians in having practised, almost as early as the latter in bricks,
13 construction in stone, when nature refused the material to t the second, we shall retain the customary order of presentation. Hence the two rivals cannot be opposed in competition. In spite of some exchanges in which Egypt appears to have received more than it gave, their careers were determined by d different physical fortunes, were distinct and extended in p parallel development.

A second Part groups in a second series the architectural styles practised by the Hittites in Asia Minor and Northern Syria, and by the Amorites, Canaanites, Phenicians and Israel-

Israelites in central and southern Syria. Compared to those of Egypt and of Mesopotamia, they not only appear youthful -- younger by at least a thousand years -- not only inferior but derivative. Yet their place is marked in the history of the art of building, because they actively contributed to the diffusion in the West of some inventions in Mesopotamia and Egypt, and since on their own account, they prove to a certain degree ingenuity and creative power.

14 PART I. ARCHITECTURES OF EGYPT AND MESOPOTAMIA.

Section I. Egyptian Architecture.

Chapter 1. Requirements. -- Topography and Monumental Chronology.

Limited to the delta of the Nile and the narrow strip of t the valley extending to the borders of the Soudan, the area of Egyptian architecture is very restricted. Yet with regard to the number and the quality of the monuments, Egypt fears no comparison. The conditions were excellently propitious for the art of building, both those of the human and the physical order.

I. The Requirements.

A first Egyptian architecture benefited by the number and the importance of the works proposed for it.

In reality its civil career was relatively mediocre. No demand for civic purposes. Even the capital, a city on the banks of the Nile, was never more than a confused mass without comforts or conveniences, and never containing edifices of p public utility.

The same was true of domestic architecture:- occasion for monumental works was lacking. The mildness of nature in the oriental climate reduced the need of shelter to a minimum; f further, customs excluded the Western conception of a durable
15 and hereditary dwelling, none caring to succeed a dead person, and the pride of the prince requiring a palace erected especially for himself. Then resulted a system of construction f for one life only, therefore slight and eminently perishable, confirmed in Egypt by the fact, that to employ the expressions of Diodorus of Sicily, "life was regarded as a small affair, and considering the brief time that one remained, houses

were inns", When these were royal, these "inns"were vast, or-
derly and luxurious, and in their construction art found its
place as well as the architect.

As for military architecture, the need for it was created
by the vicinity of poor or warlike peoples, by the results of
a frequent policy of conquest, and at certain epochs by the
division of the country into rival principalities.

In return, Egyptian art had much to do to supply an enormo-
rmous demand for temples and tombs.

According to Herodotus, the "Egyptians excelled all men in
the worship rendered to the gods"; those swarmed, each distr-
ict and each city having its own, dominated by certain supre-
me divinities common to the entire country. For them alone,
the devotion of the Pharaoh sufficied to support a religious
architecture. Son of the sun, he asserted his august origin
and his filial piety toward his celestial benefactor by erect-
ing a sanctuary, or by embellishing some of those built by h
his predecessors. And the importance of the programmes incr-
eased equally with the number of demands; complicated and pom-
pous, endowed with immense revenues, the Egyptian religion r
required ample and wise arrangements, magnificent decorations,
immense appendages, and called for the display of all resour-
ces of the art.

Meanwhile Egyptian architecture had no better patrons than
the dead.

According to the national beliefs, man could save from dea-
th not only a soul taking its flight toward the country of s
spirits.in the distant"West", but also a "double" of his per-
sonality, provided that these survivals were assured of actu-
al support on the one hand, on the other of the power to ret-
ain in the beyond the condition and the customs of this side;
that twofold requirement was provided for in embalming the
body, in conforming the figures to its effigy, in gratifying
the dead by offerings, and finally in supplying it with furn-
ishings and an image of its property, its dignities and its
pleasures.

As much as to say, that the survival depended on the solid-
ity of the tomb and on its accurate adaptation to its destin-

destination of a "house or temple for eternity". Doubtless t the poor were hastily buried, badly or not embalmed, in common pits and between layers of sand. But for every man slightly elevated, the construction of a sepulchre was the principal affair of his life. The first care of a sovereign was the choice of a site for the "dwelling in which he should remain", the adoption of a plan, and the commencement of the work; [1], besides, tha fact that this "image of Ra among the living" after death became associated with Osiris, required the organization of a solemn sepulchral worship, and consequently the erection of a temple.

Note 1. It indeed appears that the sovereigns, who built great pyramids, began by ensuring for themselves a modes monument in case of early death, which they later enlarged by o one or more coverings of masonry, with or without alteration of the internal arrangement of the original nucleus.

If it be added that Egypt never knew the family sepulchre common to several generations, that each individual had his own for himself, his wife and children, it is not surprising that the valley of the Nile is encumbered by tombs. The cities of the living have almost disappeared, but those of the dead remain, true cities divided by streets into quarters. To merely cite the principal examples, such are the vast cemeteries of Memphis, which from Gizeh through Abousir and Saccara to Daschour follow each other for a distance of more than 18.6 miles and a breadth of 0.3 to 1.25 miles; that of Abydos, immense and consecrated by the presence of the mummy of Osiris and the vicinity of the "opening", the entrance to the "realm of the West"; finally, that of Thebes, so expressively named "in the presence of his master", with its divisions of Biban el Molouk, of the Valley of the Queens, of Assasif, of Kourna, and the memory of its forty seven funerary temples.

II. Monumental Topography and Chronology.-- The Periods. -- Radiation.

In the course of the forty centuries during which at least ancient Egypt continued, architectural production was not necessarily more uniform with regard to the number than to the quality. It is and always will be impossible to make an acc-

accurate inventory by periods, not only on account of the ruin of numerous monuments, but also because of the custom of the Pharaons to place their cartouches on edifices, which they had merely restored, as well as to employ for their undertakings the structural materials of former buildings.

In the monumental history of Egypt may be distinguished four great periods. [1] A first was recently revealed on the limits of the protohistoric epoch, that of the two first dynasties, which reigned in This, and of the third, whose capital was Memphis; it commenced about 3300 B. C. and ended about 2900 B. C. A second comprises two sections of Egyptian history termed the Ancient and Middle empires, extending from about 2900 to about 1800. The third corresponds to the New empire and has for its limits the beginning of the 16 th century B. C. The last is contemporaneous with the long period in the course of which there followed from the 11 th century B. C. to the 4 th A. D., first the dynasties that reigned in the
/8 delta, at Sais and at Bubastis, then the government of the P Ptolemies, and finally that of the Roman empire.

Note 1. We follow the chronology of Meyer. According to Mariette, the initial date should be carried back to 5004: by Flinders Petrie to 4800: by Brugsch to 4445: by Lepsius to 3892.

I. First period (about 3300 to about 2900). -- However far one goes back in the historical past of Egypt -- according to the most moderate calculations to about the middle of the fourth millenium before our era --,one finds in both the lower and the upper country proofs of activity and soon of architectural science. These are furnished by the venerable ruins of monuments, contemporary with the I and II dynasties, discovered at Negaden below luxor (Tomb of king Men): at Nezlet Batran near Gizeh (tombs of the reign of Zet); at Abydos (tombs of the reigns of the Pharaohs Den and Gua of the I dynasty; of the kings Perabsen and Kaseknemmi of the II): at Kom el Ahmar (Hierakonopolis below Edfou; Temple built by king Khasekhemmi); at Zanet el Aryan between Gizeh and Saccara (unfinished Temple of the Pharoah Nofir Ka) etc.

Under the III dynasty -- at the beginning of the third millenium -- commenced the exact orientation of Egyptian archit-

architecture, at the same time at which became emphasized its progress in the art of design and of construction; proved by the excavated tombs at Bet-Khallaf and at Regnaquah opposite // This, at Saccara, Meidoum, and more particularly in the first necropolis, the Mastaba of Noutirkha; in the second the stepped Pyramid of king Zoser; in the third the stepped Pyramid of the Pharoah Snofrou (about 2900).

II. Second Period (about 2900 to about 1800). -- In the service of the princes of the IV dynasty (about 2900 to about 2700), more powerful than any of their predecessors, Egyptian architecture exhibited a new development of its tendencies a and its abilities in erecting at Gizeh the tombs (pyramids)of Cheops, Chefren, Mycerinus, and the funerary chapel of Chefren, called "Temple of the Sphynx" or "granite temple".

The importance and the quality of the productions in the t time of the V dynasty (about 2700 to about 2600) are proved in the region of Abousir by the Pyramid of Neouserre and by the Temple of Abou Gourab, which that prince dedicated to the sun; at Saccara by the Pyramid of Ounas and by notable tombs, such as those of Ti and of Ptahhotep; at Abydos by the Fortress named Kom es Soultan; at Kom el Ahmar (Hierakonopolis) by a fort; at El Kab by the wall of a city.

The architectural works of the epoch of the VI dynasty have been badly injured; their quality are however shown by the P Pyramids of Teti I and of Pepi I at Saccara, and by the remains of temples discovered in the region of the delta at Bubastis and Tanis, and at Coptos in the upper country.

These monuments of the ancient empire manifest a conscientiousness, knowledge and an artistic feeling never surpassed.

The same praise is merited by those multiplied by Egypt of the Middle empire, calm and prosperous under the government of the XII dynasty (about 2000 to about 1800). The taste for beautiful materials, particularly for granite, and the care for perfect execution distinguishes the little, that the ravages of the Hyksos and especially the rebuilding and the plunderings of the Pharoahs of the New empire have spared from w what was built by Amenemhet I, Ousirtasen I and Ousirtasen II -- the Sesostris of the Greeks --, Amenemhet III; the great

sanctuaries at Tanis, Bubastis and heliopolis; Temples of Osiris at Abydos; of Amon at Karnak, Luxor, etc.; pyramids at Daschour, Illahoun, Haouara and Licht; funerary Chapel of Amenemhet III at Haouara with such great dimensions and so complex an arrangement, that it appeared to the Greeks as a mysterious "labyrinth"; city at Kahoun; fortress at Abydos (Shounet es Zebib), on the frontier of the Soudan (forts of Semnen and of Koumeh) etc. For themselves, the vassal princes of u
20 upper Egypt desired tombs in proportion to their rank; such as at Siout, the tombs of local noblemen; at El Bersheh, those of the masters of the nome of the Hare; at Beni-Hassan, those of the sovereigns of the principality of the Gazelle etc.

III. Third Period (16 th to 11 th centuries). -- After a period of depression contemporary with the great crises affecting the country as a result of the invasion of the Hyksos, when the New empire had restored favorable conditions about 1550, Egyptian architecture assumed a new flight, urged more strongly than it had ever been previously by warlike, glorious and showy kings, masters of immense resources in men and materials, and by an opulent people, exalted by the national grandeur.

The time of this renaissance is divided into two periods, distinguished by unequal quality of execution.

To the first belongs the structures of the XVIII dynasty (1540 - 1350) and of the first period of the XIX dynasty (1350 to about 1292). These are in general works carefully executed and of high artistic value. Some betray Asiatic influences according to the relations which Egypt had with Syria and Mesopotamia by means of its expansion into Asia.

First at Karnak is the part of the great Temple of Amon behind the great hall, erected by Thoutmosis I, queen Hatshepsouet and Thoutmosis III (1540-1447); in the Theban necropolis at Deir el Bahari is an imposing funerary Temple for the worship of Thoutmosis III and Hatshepsouet; at Medinet - Gourab near Illahoun are the remains of a city founded by Thoutmosis III; at Beni-Hassan and excavated by the same sovereigns is a subterranean Sanctuary of the goddess Pekhet, better known under the name of Speos Artemidos. To Amenophis III

(about 1411-1370) are due another at Luxor, the Temple of the triad of Amon, Mout and Khons; another at Medinet-Habou nearly destroyed, but whose entrances continued to be marked by two colossal statues celebrated in antiquity under the name of the colossi of Memnon; in the island of Elephantine the memory of two charming chapels fortunately determined by engravings, dedicated to Khnoumon and destroyed about 1822-1825. A.D. However ruinous it may be, Khanit Aten, the temporary capital that the heretic Amenophis IV (1370-1358) created for himself, on the actual site of Tell-el-Amarna, where he apostasized from the worship of Amon and abandoned Thebes, is singularly interesting to us on account of its palaces and houses. Finally on account of the powerful Seti I of the XIX dynasty (about 1315-1292) figures the great hall of the Temple of Amon at Karnak, one of the marvels of the national art; t the covered nave of the Temple at Luxor, taken from a rival structure; funerary temples at Kourna and at Abydos; one of the principal subterranean tombs of the group at Biban el Molouk in the Theban necropolis.

Thenceforth is a marked tendency to prefer grandeur to beauty and to neglect the construction, which rapidly developed the worst results in the course of a period commencing with the reign of Ramses II (1292-1225). If Egyptian architecture had desired to proceed conscientiously, it could not have responded to all demands lavished by the building fever of that monarch. From the Mediterranean to the borders of the Soudan, he restored, completed, rebuilt or created. At Tanis, he erected a Temple of Seth, now ruined; at Bubastis, he transformed that of Bastet; at Memphis, on the national sanctuary of Ptah were works, whose memory is preserved by two colossal f figures in his image; at Saccara, he excavated the first galleries for the burial of Apis, the Serapeum; without mentioning the tomb prepared for his mummy at Biban el Molouk, he e erected for himself in Abydos two funerary temples, one of w which is the famous Ramesseum; at Karnak, he enclosed the great Temple by a wall; at Luxor, he pleased Amon by a court with porticos and an enormous pylon; in lower Nubia, he commemorated his journey by the evidence of subterranean temples.

particularly that of Ptah at Gerf Hossein and those of Harakhte and of Hathor on the steep banks of Ipsamboul etc.

Under his successors, architecture suffered by the decline from the Egyptian grandeur. Both were restored by the great Pharoahs of the XX dynasty, Ramses III (1200-1179), creator of a Temple of Khons at Karnak; of a superb Tomb at Biban el Molouk; at Medinet-Habou, a great funerary Temple, preceded by a triumphal gateway; at Tell el Yahoudieh, north of Cairo, by a Temple distinguished by the peculiarity of enameled decoration.

IV. Fourth Period(11 th century B.C. to 4 th century A.D.). With the reign of Ramses III closed the heroic age of Egyptian architecture. Henceforth the country was reduced to its own territory, and was deprived of any opportunity for enriching itself at the expense of Asia and of the Soudan, and its kings being weakened and always menaced, it almost always lacked the means and too frequently the taste for building. As the results of five centuries only unimportant undertakings are to be noted:- addition of a court with porticos to the great Temple of Karnak by Sheshonk I, the first of the Libyan princes of the XXII dynasty (945-745), who further completed the Temple of Bastet in Bubastis, their capital; enlargement of the Temple of Ptah at Karnak by the Ethiopian Shabako (XXV dynasty; 712-700); by his successor Taharqua (688-663) the erection of a kiosk in the first court of the Temple of Amon and a Chapel of Osiris.

Quality should compensate for quantity, but in all respects a decadence occurred.

Yet under the Saitic sovereigns of the XXVI dynasty (663-525) was a renewal of prosperity, a revival of architectural demands and a renaissance of art. At Sais itself were erected by the orders of Psammetik I and of Amasis, monuments that aroused the admiration of Herodotus, but which have vanished, washed away by the Nile, and especially regularly utilized as quarries of dressed stones; the Temple of Ptah at Memphis was finished by Psammetik, who likewise met the cost of a considerable extension of the Serapeum of Saccara; in the Theban n necropolis were excavated the tombs of the quarter of Asasif,

some of which exceed in dimensions those of the New empire.

Reacting against the excesses and the negligences of the school of the period of the Ramses, the builders revived the sane methods of the first period; they sought beautiful materials, dressed them perfectly, without fear of dimensions whose enormity astonished Herodotus, and they restored the freedom and elegance characteristic of the ancient style.

The end of the 6 th century, all of the 5 th and the first quarter of the 4 th were sterile, as a result of the depression caused by the conquest of Egypt by the Persians (525). But to the accession of the XXX dynasty corresponds a national elevation, the more favorable to architecture because it coincided with a remarkable development of the worship of Isis-Hathor. To her Nectanebes (378-361) dedicated a magnificent Temple at Behbit el Hagar, near his capital Sebennytos, now ruined (the Iseum of the Romans); for her again Nectanebos (358-341) built on the island of Philae a Sanctuary preceded by a portico; without mentioning numerous secondary structures in the entire extent of the country, all of excellent quality.

At the same time a colony of Egyptian architecture flourished in Ethiopia, whose memory is preserved by the pyramids of Meroe, showing the character of frank and barbaric imitation.

Ptolemaic Egypt (285-21) remains a select country for architecture.

Alexander the Great marked his brief sojourn by ordering a "Chapel of the Boat" for the sanctuary of the Temple of Luxor, and of the brief reign of his son Philip Archideos, the Temple of Amon at Karnak retains a trace in its "granite chapel". As for the Ptolemies, they multiplied throughout all Egypt t the evidences of a devotion addressed particularly to Isis-Hathor. These were not merely embellishments, like the addition of a great pylon to the Temple of Amon at Karnak, but were a also creations. Such were in the island of Philae, the Temple of Esculapius by Ptolemy Philadelphus (285-247) and that of Isis by him and by Evergetis (247-222), also that of Hathor by Philometor and Evergetes II (181-117). Such were again the magnificent Temple of Edfou, erected by Evergetes I and

Philopator (285-206); those of Deir -el-Medine at Thebes and of Dakke in lower Nubia, commenced by Philopator (247-205); the Temple of Khnoum at Esne and that of Sobek and of Haroeris at Kom Ombo by Philomotor (181-146). The half Temple of El Kab for the worship of the goddess Nekhbeyet, and a Sanctuary of Osiris at Karnak, recall the reign of Evergetes II ((146-117), while the vast Temple of Hathor at Denderah owes its foundation to Neos Dionysos (80-52).

Even in Roman Egypt art was not idle; in truth it was particularly occupied with the completion and decoration of edifices more or less advanced by the last Ptolemies. Yet a Temple in the island of Philae, another at Dendour, a third at Kalabghe south of Assouan, date entirely from the imperial p period.

In spite of the permeation of Hellenism, which favored the the origins of the Ptolemaic dynasty, Egyptian architecture remained till the close of its career faithful to the national tradition. In a general way its latest creations are notable for care in execution and by the life, sometimes rather exuberant, but often very happy in its decorative invention.

The radiation of Egyptian architecture was considerable. Central and southern Syria -- particularly Phoenicia -- and Cyprus were dependent on it. Mesopotamia did not escape its influence, which was also exerted on the Egean civilizations, comprising therein the Hellenism in its Doric species.

Chapter II. Natural, Human and Technical Conditions.

The conditions that architecture found in Egypt were most favorable to its development, as we have already stated.

I. Natural Conditions.

Those of a physical nature were entirely propitious. And first it had at command rare facilities for the supply of its materials.

The country is certainly very poor in wood, and the little that it possesses is of a quality more than mediocre; there is the palm, which is fibrous, impossible to cut into the members of a framework, and incapable for resisting flexure as well as crushing; the sycamore, that lacks density and strength. the acacia and the tamarisk are better, but only furnish pieces of small dimensions. However, at least for careful c construction, the adjacent coast of Syria, with the convenience of maritime transportation, offered the formerly immense resources of its forests of cedars and cypresses.

The lack of wood is also largely compensated by the abundance and excellence of the elements of construction in bricks or in stone.

The mud of the Nile is compact and dries very hard, being nearly incompressible.

Everywhere the steep banks bordering the valley contain stone, and in many places they afford in some kinds the finest specimens known.

26 Limestone is found in the Arabian range for its entire length. The principal quarries are;- in upper Egypt, that of Djebel Silsileh on the eastern bank of the river; in middle Egypt, at Djebel Abou, Het Noub and El Kosseir. in the low c country, in the vicinity of Cairo are those of Masara, Toura and of the Mokattam, where abounds stone, admirable for its fine texture and the perfect polish it can receive.

The eastern hills of Djebel Ahmar near Cairo and the western at the north of Assouan are rich in sandstone.

Alabaster is easily obtained from the Arabian range from D Djebel Masara near Cairo to Siout, particularly at Het Noub and El Kosseir.

Finally in the Libyan range can be quarried enormous blocks of hard stone of very dense texture and in various colors; t

the most beautiful are taken from the quarries of Wady Hammamat, which supply a dark granite, and especially in the region of Assouan (formerly Syene), rich in splendid materials, quartz and mica, yellow, brown, reddish and black.

Another favor of nature to architecture is the exceptional convenience of transportation in Egypt. The slimy soil of t the valley aids the sliding of the sledges, and the Nile is one of the most useful of the "moving roads", since the inhabitated places are in great numbers along its banks, and for the others, nothing is easier than connection by a canal, when communication does not naturally occur in a flood.

Egyptian architecture further benefits by the extraordinary dryness of the local atmosphere, assuring on the one hand the preservation of unburnt bricks, and on the other the almost indefinite duration, not only of sculpture but also of painting, even underground, favoring both construction and decoration. Add an intensity of light, such that the problem of the lighting of interiors is practically suppressed, a very small opening sufficing to light a vast hall.

It is true that opposed to these advantages are the difficulties caused by the extreme narrowness of the upper valley, in some places not permitting a building under the open sky[1]; (see pages 46, 47, 57, 58); the instability of the alluvial soil, always more or less undermined by the infiltration from the Nile; finally the corrosion of stone by nitre in solution in the waters of the floods.

II. Human Conditions.

The conditions of the human order were relatively natural.

Architects, foremen and workmen were readily obtained through the moral, social, political and economical condition of
48 Egypt. The dignity assigned by custom to the architect -- it was practised by princes of the royal blood, and the chiefs of the official building service were counted among the highest dignitaries of the state -- was suited to exalt those practising it, as well as to attract superior men.

Naturally industrious and excellently trained by regular specialization into an organization of labor by incessant practice, the race furnished excellent workmanship. Finally in

case of great need, kings, princes and noblemen controlled a numerous and submissive people, which could be levied at pleasure, that the hydraulic nature of the Nile permitted to be used largely without injuring the prosperity of the country, and to which the power of the empire of the Pharoahs added at times multitudes of captives in war.

Note 1. Indeed, besides the culture of a soil periodically fertilized by the Nile, where the planting required scarcely any preparation and thus was not very pressing, the inundation compelled the peasant to idleness during a quarter of the year.

In Egypt the technical and artistic condition of architecture was fated, determined largely by certain physical and human peculiarities. And first in no country have the nature of the materials, the appearance of the landscape, the sky a and the climate have more despotically imposed the system of construction, the effects of form and decoration in accord with their characteristics.

Because the monumental productions of Egyptian architecture depended exclusively upon wealthy sovereigns, grown old in absolutism and often in military glory likewise, there must result a tendency to prefer material grandeurto perfection, a desire for exciting impressions, strong rather than refined, to astonish rather than satisfy the eye and the mind; finally the need of fulfilling the demand at any cost. The excessive importance of the undertakings, a result of the origin of the demand, and the ordinary effects of direct execution by the government, by workmanship too frequently dominated by unprofessional levies, necessarily introduced opportunities for error, for negligence and bad work. Finally on account of i its official condition, Egyptian architecture was devoted to conservatism and to formula, just as it was elsewhere condemned by the rule of the community, carefully closed and strictly specialized, which was that of free labor.

21 It could not depend upon the national temperament; affected for good or evil by what it comprised of submission, of simplicity and of carelessness -- these qualities excluding boldness, initiative and system, as well as regularity and accur-

accuracy,-- it was still influenced by that "sagacity" that a
antiquity honored in Egypt, which made it skilful in avoiding
difficulties.

III. Technical Conditions.

In truth the preeminent quality of the builders in ancient
Egypt was an admirable ingenuity, fertile in practical exped-
ients. Those men that astonish us by the colossal proportio-
30 ns of so many of their buildings, by the number and extent of
their excavations, by the perfection of their work of the st-
necutters, by the enormous magnitude of the blocks so freque-
ntly handled, done with rudimentary tools and ignorant of the
more primitive of our machines.

The drawing of an ellipse done in ink on a plastered rock
wall belonging to the Tomb of Ramses VI at Biban el Molouk (
(12 th century B.C.) shows, that they knew how to trace full
sized sketches of their outlines. But they did not proceed
by learned calculations, and did not embarras themselves by
exactness in the measurements. "It is necessary", Mariette
writes, "to have measured with measure in hand the tembles and
tombs of Egypt to know how frequently the two opposite walls
of the same chamber are not of equal length".

From the time of the I dynasty, the Egyptians possessed cop-
per tools; but they long continued the use of masses of stone.
After the XII dynasty (beginning of the second millenium), t
they made their tools of bronze, and from the Saitic epoch
(7 th century), these were made of iron.

For working wood, they used the axe, adze, saw, chisel and
gimlet. They divided stone by the aid of the saw with sand,
and drilled it by means of a bow drill imparting rotation to
grains of sand; they shaped it by striking with the point and
the pointed hammer and by notches cut with the chisel; final-
ly they polished it by rubbing with pebbles, sand and sandst-
one.

The working of quarries was carriedon according to circums-
tances, under the open sky or by means of galleries, whose c
ceilings were supported by piers left in the mass. Blocks w
were detached by cutting grooves, then driving bronze wedges
in them, or wooden wedges were caused to swell by wetting them.

Transportation to the site was accomplished by water as much as possible, the great monoliths and obelisks being suspended between two boats and doubtless submerged, to reduce the-
31 ir weight. On land were employed sledges, sometimes dragged by teams of oxen or men, sometimes pushed by the force of levers, on a track previously smoothed and watered (15). If a difference of level existed, it was compensated by the construction of an inclined plane. At Gizeh may still be recognized the one, that served to supply the yards of the great pyramids, and which is mentioned in the story of Herodotus, as a kind of causeway of polished stones 3034.8 ft. long and 62.3 ft. wide.

The institution of the levy was a necessary condition for such works of approach and equally favored the application of a method of construction imposed on Egyptian architects by t the scarcity of wood, and which further yielded important practical advantages. In nearly every case all wooden scaffolds were avoided. For an isolated wall, they profited by t the advantage of bricks or stones set in transverse rows to raise a stairway at one end; in this manner under the best conditions the working place was supplied on the backs of men. The need supplied, the vacancy was quickly filled.[1] (16, I;37). If an edifice were undertaken, as the walls and columns were carried up, the spaces were filled with earth, which supported the surfaces already leveled or a pavement of bricks; by this means the workmen were furnished with an extended and f firm platform at all stages of their work.

Note 1. The expedient was constantly utilized for the erection of pyramids, which according to Herodotus "were first b built in form of a stairway with steps or ledges".

Access to these terraces was assured by ramps and whenever the horizontal length was insufficient, by groups of stairways, some examples of which remain on the faces of the unfinished pylons of the great Temple of Amon at Karnak (16,11). T
32 The steps of each were formed by the erection of two buttresses in unburnt bricks, stayed apart and held together by wooden timbers, the spaces being filled with tamped earth, producing a sort of series of steps, each about five feet high. The bricks and stones were raised from step to step, the for-

former by slaves, the latter being raised by machines, which
Herodotus mentions uithout explaining, and which have just b
been tried with entire success by M. Legrain, the skilful res-
torer of the Temple of Karnak. They were of two kinds, accor-
ding to whether it concerned great monoliths or stones of av-
erage dimensions. The former were raised to the level of the
higher steps by alternately using levers and wedging up, then
slid on the top by the aid of rollers, finally raised anew a
and so continuing. For the second the raising was far more
rapid by the use of apparatus as simple as ingenious, that M.
Legrain discovered and restored to use, and which M. Choisy,
from whom we borrow the illustration, has termed the "rocking
lift".[1] This is a wooden rocker, made of two segmental sides
strengthened by cross bars, on which is placed the stone.(17).
If one end be pressed down, the other rises; if a wedge be s
slipped under it, it rises and is balanced on that. When by
blocks a platform is made at the level of the wedge and the
operation is repeated, there is gained each time the thickne-
ss of the wedge; this is repeated until the height of the up-
per step is attained, on which one proceeded again and so con-
tinued. Rocking is done without difficulty by the work of a
lever moved by the force of a man, or more practically by sus-
33 pending him at its end. At need, several slaves could join
their weights or pulls. Practically to elevate the apparatus
loaded with 1 1/2 tons sufficed a force equivalent to 441 lbs.
(0.22 ton).[2]

Note 1. These rockers commonly appear among the number of objects, that the Egyptians placed in the foundations of their edifices. The museums preserve numerous examples of them.

became clear

Note 2. Suddenly this formerly obscure passage of Herodotus relating to the construction of the great pyramid- - "they raised on the first step the stones by the aid of machines made of short pieces of wood. They were raised from the first to the second step by means of another machine, and this continued; for there were as many machines as steps, or perhaps there was but a single machine, that could be readily moved from step to step". Book II.

The setting of the colossal masses in which the Egyptians delighted, of obelisks or architraves like those of Karnak,

which weigh more than 44 tons, was no less remarkable. Interpreting the arrangements presented by the monuments, M. Choisy has given a luminous explanation. On the upper surface of the base were hollowed grooves or recesses. In them were placed intestines or sacks filled with sand, having a capacity less than the cavity, yet sufficient to cause the sack to project above the surface of the bed. The stone being once correctly placed, it sufficed to pierce the sack in order to cause a slow and safe descent of the block; when compressed, the sand ran into the recesses, afterwards being covered and invisible.

In their architectural undertakings, the Egyptians made ex-
tensive application of the principle of the division of labor.
34 They divided the work among the numerous yards, to which eno-
ugh independence was accorded, so that some portions of an e
edifice reveals different procedures in execution, according
to the sections. To excavate a tomb, they arranged several
faces of attack above each other; at the Tomb of Ramses III,
no less than four can be counted. In its turn each gang sub-
divided the work among a squad of trained workmen, who carri-
ed it on, a section of artisans following it and a numerous
body of laborers, who served both.

In brief, Egyptian methods exhibit a great expenditure of ingenuity, a lavish employment of intelligent efforts, and a very strict discipline of labor.

Chapter 3. Programmes and their Realization.

I. Domestic Programmes.

The House.

Considered in its essential features, the arrangement of t the Egyptian house is equally appropriate to the purpose, the climate and the customs. Indeed it favored at the same time the securing of coolness, shade and ventilation desirable beneath the sky of Egypt, as well as the twofold isolation required by the oriental; that of the house from the exterior a and that of the domestic apartments from the reception rooms, or otherwise that of the harem from the living rooms.(19,40).

Aristocratic or citizen's, urban or rural, an Egyptian habitation averted itself from the exterior, since it was screened by a high enclosing wall, sometimes with battlements, or by a blind gable at most pierced by a few openings, small and located very high. Yet the doorway was always carefully treated, sometimes in the form of a pylon, or it was preceded by a columnar porch.

The plan of the dwelling of a citizen of the middle class comprised a court, larger or smaller, sometimes enclosed by a portico, around which were arranged the dwelling, offices and storerooms.

35-

In a rural villa or the mansion of a rich man, there is a more marked separation between the offices and the house proper.(19,7; 20). Its elevation comprised a ground story, generally raised, commonly with one or two upper stories and frequently an open gallery with a terrace with light roof, or w with small structures, divided into two apartments, one for daily life and receptions. The second was first located and in its turn was subdivided into a summer salon and into a r room with the twofold purpose of winter salon and dining room; the first consisted of a portico exposed to the north; the o other adjoined and received light from it, unless this entered directly from the sky through an opening at the centre of the ceiling; it was large and its roof was generally supported by columns. As for the domestic portion, this comprised in the rear and in the second story groups of small and dark chambers, those for sleeping being provided with a sort of alcove with elevated floor.

There was considerable luxury and but mediocre comfort; at least least the sole precaution against the bad effects of h heat was the construction of thick walls; the reduction of t 36 the number and the dimensions of windows and their partial c closing by sashes and shutters; the covering of the house by an isolating layer of earth, also affording the enjoyment on a terrace, accessible by an external stairway, of the mildness of the evenings and the coolness of the nights. Besides as soon as they had the means, the Egyptians never failed to secure the pleasure of a garden with numerous alleys of palms, fig trees, acacias, vast basins animated by water birds, and with kiosks of open structure, a sort of canopies set on slender colonnades.(20).

The Palace.

A royal palace was distinguished from that of a noble or of a rich man only by more ample proportions, a stronger enclosure, and a more complete differentiation of the different parts. Around that of Amenophis IV at Tell el Amarna extended a double wall separated by an outer road with a width of 6.6 to 9.8 ft; a covered hall measured 1022.6 sq. ft.; the harem formed an independent dwelling.(19, 6).

37 Moreover, the necessity for lodging a court, officials and servants equally numerous, and to store enormous receipts or tithes in kind, introduced the need of lodgings and storehouses in connection; the appendages of the Ramesseum will give an idea of the latter.

II. Military Programmes.

Egyptian architecture did not show itself expert in fortification. Doubtless at a time when defense was very superior to attack without machines, and with walls 32.8 to 82.0 ft. high and crowned by a continuous platform with a battlement parapet, this constituted a nearly impassable obstruction. But against the peril of forcing the gates and that of undermining the walls -- the second being particularly feared on account of the construction in unburnt bricks, and the impossibility of shooting without exposing the body, when an adversary had reached the foot of the rampart -- only insufficient palliatives were invented. The arrangement of a guarded entrance employed at the fort called Shounet es Zebir at Abydos

at that of Kom el Ahmar, illustrated sufficiently by sketches
3, 4, 5 and 6 of Fig. 21, was an ingenious and practical art-
ifice, but it obstructed the passage too much to be employed
at the gates of cities, which indeed remained without defense.

As for undermining, at first could only be opposed the thi-
ckness of the ramparts, sometimes amounting to 39.4 ft., the
space between them and a front wall of half the height and
thinner than the main wall, and finally, the downward shooti-
ng of defenders placed on wooden balconies projecting from t
the walls at regular distances.(21, 5, 6). About the epoch
of the XII dynasty appeared at Semneh, Kourneh and Kom-Ombo
the trench, excavated for a width of 98.4 to 131.2 ft. with
a very rudimentary sketch of the only system for effectively
defending the base of a wall, that of flanking it by buttres-
es or bastions.(21, 1, 2, 3, 4).

III. Funerary Programmes.

We have already noted, that the future life, as conceived
in Egypt, strictly depended on the permanence of the conditi-
36 on of the present one, on the one hand on the duration of the
corpse, embalmed for that reason, or at least on the existin-
ce of an image of the deceased, and on the other on the poss-
ession of provisions, furniture, articles of luxury or utili-
ty relating to the general needs of man and to the particular
rank of the departed. Then in Egypt the programme of the to-
mb was quite analagous to that of the dwelling, and comprised
37 the erection of a true habitation arranged in two parts; a p
private chamber for the mummy and the images of the deceased,
and a room for dining, work or recreation, where finally mig-
ht be received the visits and offerings of the living; in br-
ief, a cave and a "chapel". Architecture fulfilled these in
a remarkable fashion at the end of an evolution extending un-
der the three first dynasties. Its formulas varied according
to whether it operated in lower or upper Egypt, and on accou-
nt of a private man or for a sovereign.

The Mastaba.

In its rudimentary form the Egyptian tomb was reduced to a
pit, at first circular, later oval and finally rectangular,
in which are found interred together the corpse and its equip-
ment.

The twofold desire to ensure the preservation of both and to conform the "dwelling for eternity" to the image of the terrestrial was the incentive for an evolution, whose greater stages will be noted.(22).

A first advance substituted for the arrangement of a filled pit that of a chamber kept empty by enclosing walls and a covering.(3, 4).

It was a second when bymeans of a wattled partition and later by a wall, a separation was made between the chamber for the dead and one or more cells for its provisions, attached at one end of the sepulchral chamber, at both ends or at the four sides.(7, 8, 9). The volume formed by the whole might m measure from 53 to 19055 cu. ft. (Tomb of Qua at Abydos), the chamber in great tombs, like that of Men at Negadeh or of Qua at Abydos, occupying areas respectively of 452 and 1399 sq. ft., with a height to the ceiling of 3.3 to 8.2 ft. The tomb was exceptionally above ground in the form of a rectangular structure with blind faces and crowned by a terrace -- what Egyptology terms a mastaba.[1] The normal arrangement extends over a sunken structure -- the chamber and the cells -- whose ceiling is level with the ground, its floor from 3.3 to 13.2 feet beneath it, with a superstructure or mastaba in the shape of an oblong truncated pyramid projecting largely beyond the tomb, and composed of a filling of sand or earth retained by the walls.

Note 1. The Arab name for the divan constructed by orientals.

Toward the end of the I dynasty, the approximation of the tomb to the house was much advanced by opening at one side of the lower structure a doorway, accessible by a stairway and closed by a stone portcullis sliding in grooves in the jambs. (11, 12, 13). It was carried further by the architecture of the II dynasty, which ensured a communication between the chamber and the different cells by arranging around the former a passage into which the cells opened.(14).

Yet the tombs of the epoch of the III dynasty at Bet Knallaf, Requaqunah and Gizeh exhibit considerable progress in the sense of an accurate adaptation of the tomb to its purpose. On the one hand the safety of the corpse and its equipment w was increased by the precaution of excavating the chambers in

the depths of the earth, even to more than 75 ft. below the
surface, the means of access consisting **of stairways**, corrid-
ors or wells concealed at the terrace and carefully obstruct-
ed by sliding blocks of stone and sand filling. [1] (23). On
the other hand the fulfilment of sepulchral worship was facal-
itated, at the same time that the resemblance of the dwelling
of the dead to that of the living became distinct, by two suc-
42 cessive innovations; a first one added to the eastern facade
of the superstructure a representation of an entrance; a sec-
ond made of this "false doorway" a real one, affording passa-
ge to an oblong hall parallel to the facade, with a "false
doorway" on its western wall; then the deceased had his recep-
tion hall, open to the pious visits of the living, bearing o
offerings. Completing the approximation of the tomb to the
house, a **front** wall was parallel to the eastern side of the
mastaba, enclosing a court.(24, 1, 2, 3).

Note 1. At the Tomb of Neter Khet at Bet Khallaf, the mastaba measures 278.9 × 146.7 ft. with a height of 26.3 ft.: t the sepulchral chamber is 16.4 ft. square and 9.8 ft. high, 88.6 ft. below the summit of the mastaba and 52.5 ft. below the surface of the ground. The largest of the sliding blocks of stone is 16.4 ft. high, 9.8 ft. wide and 2.0 ft. thick.

The substitution of stone for bricks, the exclusive choice
of the well as the means of access to the lower structure, a
and the arrangement of a true dwelling in the mass of the su-
43 perstructure distinguish the mastaba of the III dynasty, unk-
nown **till** very recent times, that of the ancient empire, bet-
ter known and preserved.(24, 4 - 7). The part beneath the op-
en sky remained a terrace of rectangular plan and variable d
dimensions; [1] the principal axis being more or less carefully
orientated from north to south. Four times in five, the fac-
ade is at the east; if not, it is turned toward the north.

Note 1. One measures 26.3 × 19.7 ft., another 173.9 × 85.8 ft.

The internal arrangement substantially comprises a "chapel"
and a "serdab"above ground with a vault underground. The wes-
tern wall of the first was always provided with a "false" do-
orway, before which was found a "table of offerings". As for
the serdab, reduced in width and height and generally placed

at the south and sometimes on the north, but rarely at the west of the room first mentioned, it contained the images of the deceased, and frequently in order to permit them to smell the odor of food and perfumes, it communicated with the chapel by small openings. For a dead person of distinction the entrance was succeeded by a porch, one or more vestibules, and columnar halls with the closets reserved for provisions. There might even be several complete suites, one reserved for the deceased man, another for his wife and a third for his s son. Paintings on the walls represented the occupations and the earthly recreations of the dead, his properties and his dignities. The dimensions varied greatly; the double of Ti had at Saccara a chapel 23.6 ft. long, 22.6 ft. wide, and a columnar hall measuring nearly 1830 sq. ft. (24, 5, 7).

The chamber for the sarcophagus was excavated in the southern part of the underground portion to a depth averaging about 40 ft., but which frequently extended to 66.6 or even 98.4 ft. It was accessible by a low corridor opening at the bottom of a large well of square section, whose upper end was in the terrance of the mastaba. (24, 6).

The Pyramid.

At the same time as the development of the type of the mastaba, the funerary architecture of the III dynasty derived **the formula** of the pyramid from a very slightly different application of the same principle.(25;9u6

This comprised a superstructure and a substructure. At the centre of a square area enclosed by a wall, with a gateway at the middle of the eastern side and facing an avenue, rose a solid structure conceived in the style of a mastaba and similarly orientated, but early placed on a square plan, pointing toward the sky and capable of enormous dimensions. [1] The **chapel** was separately placed as a kind of small structure, really an actual building adjoining the eastern face of the monument and divided into **vestibule**, halls and courts. [2]

Note 2. Pyramid of Zozer at Saccara: rectangular base of 393.9 x 352.0 ft.; height 213.7 ft. Pyramid of Mycerinus; base 354.3 ft. square, height 280.2 ft. Pyramid of Chephren; base 707.7 ft. square, height 454.2 ft. Pyramid of Cheops:

base 764.5 ft. square, height 480.7 ft., volume more than 88, 267, 500 cu. ft.

Note 2. That of the Pyramed of Snofrou at Meidoum measures externally 29.5 ft. and comprises two parts, a court with an altar for offerings between two steles, together with vestibule and sanctuary; that of the Pyramid of Mycerinus at Gizeh is composed of a vestibule and a group of halls opening on a court, the whole covering a nearly square area of more than 32,290 sq. ft.; that of the Pyramid of Ounas at Saccara forming a relatively important group of porticos, courts and halls.

The properly sepulchral portion was formed of a chamber or an apartment, excavated in the rock to a depth more or less great, with a system of corridors and of cells accessible by a gallery concealed at the surface of the ground or opening on a face of the pyramid and barricaded by stone blocks. Complexities and peculiarities such as branching passages, blind passages, repetition of chambers at different levels, even in the solid rock beneath the surface of the ground -- as at the Great Pyramid, -- resulting either from modifications in the plans because of enlargement, or from the desire to decive the violators of tombs. [1]

Note 1. The Pyramid of Cheops is typical in that respect. (25, 43). At nearly 101.7 ft. beneath its base and almost under its centre exists a rectangular chamber, orientated like the edifice and measuring 45.9 x 27.0 ft. and 11.4 ft. high. It is accessible by a narrow and low gallery (4.0 ft. wide a and 3.5 ft. high), that opens on the north face of the pyramid at 49.2 ft. above the ground, and is closed by a block moving on a pivot; it descends for a length of nearly 223.1 ft., then continues as a landing for 20.4 ft. The sepulchre was unfinished, when an extension of the primitive plan caused it to be abandoned. Its purpose was changed to a chamber -- to which was given the name of the "queen's chamber" -- arranged in the mass of the monument, a little north of the vertical axis at about 65.6 ft. above the level of the ground; its dimensions are 18.7 x 17.0 ft. and 20.2 ft. high; it is reached by the gallery previously mentioned, then by a corridor branching from its ceiling, first ascending for a length of 108.3

ft., afterwards being horizontal. A third modification caused the creation of a new chamber, located a little over 137.8 ft. high and composed of two rooms, a small vestibule and a chamber 191 ft. high, 17.1 ft. long from north to south and 34.2 ft. from east to west: there is still found the sarcophagus of the Pharaoh. It is reached by a gallery continuing the ascending portion of the preceding one, and which is 147.6 ft. long, 3.42 ft. wide and 27.9 ft. high.

The Tomb in Upper Egypt. -- The Hypogeum. -- The Tomb in Lower Egypt.

Yet the allied schemes of the mastaba and of the pyramid w were not appilcable in upper Egypt. Elevated and accessible with difficulty, with ravines at their summits, the Libyan a and Arabian ranges did not lend themselves to the establishment of cemeteries, like the table lands on the west of the lower Nile. Therefore being compelled to place the dead in tombs close together on the narrow strip at the foot of the bank spared by the inundation, or in artificial grottos excavated in the sides of the hills.

But the first solution, examples of which abound at Abydos
46 and Thebes, on account of the friable nature of the soil, could not comprise a funerary chamber excavated in the ground, and it was necessary to arrange as a sepulchre in all or a p portion -- according to the dimensions of the monument -- of the square or pyramidal mass of the superstructure (26).When, as frequently happened, it could not be placed in the form of a vestibule, the chapel was reduced to the symbol of the "false doorway"on one face of the small structures, preceded by a little court and small garden.

The type in the rock,-- subterranean -- as it appears at B Beni-Hassan, El Bersheh, Thebes, Siout etc., substantially repeats the entire internal arrangement of a sepulchre in lower Egypt, passing through a porch more or less monumental, one successively enters a square or oblong hall, sometimes subterranean, then a chapel at the back of which is found the "false doorway"; from floor a well gives access to the sepulchral c hamber. At other times the latter was not beneath, but beyond the axis of the chapel, at the end of a corridor that might measure 131.2 ft. (27, 1, 2).

From the day that the capital was transferred from Memphis to Thebes, it became necessary to find for the royal dead an equivalent of the pyramid, accommodated to the special geographical requirements mentioned. Also the evolution of belief determined a modification of the primitive programme.

Sepulchre and chapel were distinctly separated, often by g great distances.

The first was excavated in the Libyan hills and was composed of a long series of inclined corridors, descending stairways and of chambers, in the image of the series of corridors traversed by the sun with his train of souls during the nocturnal course of his bark through the infernal regions of Amentit. Certain caverns were in form of columnar halls, especially those in which the mummy reposed. The longitudinal extent of these tombs was considerable; [1] it frequently measured 197 to 262 ft.; it attained 410 ft. in that of Ramses III, and in the hypogeum of Seti I, it would have exceeded 475.7 ft. as measured today, had it not been interrupted by a landslide. (27, 3). To mislead robbers, precautions and deceptions were multiplied; false wells, blind passages, masked by an artificial landslide before the external opening.

Note 1. Hence the name of Syrinx given to such a tomb by the Greeks, on account of the analogy they found to the reeds of their flutes, the syrinx.

At the same time that he prepared in the heart of the hill a hiding place for his mummy, the sovereign realized the "chapel" indispensable to the funerary worship of his "double" by erecting somewhere in the plain an actual temple, similar to those of the gods in the company into which death introduced him.

None of the types just examined was suited to the alluvial lands of the delta. The one there employed placed above a h high brick base chambers in which were deposited the mummies. As for the kings of the dynasties that reigned at Tanis, Sais or Bubastis, if we believe Herodotus, a sepulchre was arranged for them in the court of a temple.

IV. Religious Programmes.

No more than a dead person, could an Egyptian deity pass f from its dwelling on the banks of the Nile; for its real pres-

presence on earth was believed, under the appearance of a statue, animal or an object consecrated to it, and therefore i 48 imbued with its personality. "House of god", "chateau of god", were in Egyptian language the significant appellations of the temple, besides being amply justified by the perfect conformity of its arrangement to the plan of a human dwelling. 49

50 While this was merely a miserable shelter and the rites remained elementary -- we know this by the representations of the primitive sanctuary given by the hieroglyphic signs -- the gods were contented with modest chapels similar to the wattled hut covered with mud or to the cabin of bricks and of wood, according to the periods, which sufficed for men; the small structure occupied the centre of a palisaded enclosure, and before its gate rose two masts.(28,1).

When the progress of civilization had produced an enlargement and subdivision of the Egyptian dwelling, the gods immediately benefited thereby.

And first the sun obtained from the piety of his sons, the Pharaohs, the homage of imposing edifices, a specimen of which we possess in the Temple of Abou-Gourab near Abousir (28, 2). On the terrace of a high artificial substructure, a rectangular court (328. × 246. ft) was bounded by a series of c chambers and storehouses. Its eastern portion near the entrance was arranged as an abattoir for the sacrifices; toward the centre it bore a massive altar 18.0 ft. long, 19.7 ft. w wide and 3.9 ft. high; finally at the west stood a truncated pyramid surmounted by an obelisk, reaching a height of about 98.4 ft., the symbol of the god.

Yet from the distant times of the Ancient empire -- on the evidence of the funerary Temples of Chephren at Gizeh (Temple of Granite or of the Sphynx) and of Neoserre at Abousir -- t there existed in its power the normal Egyptian temple, which was to raise to a climax the grand Theban period (28, 3). L
51 52 Likewise its arrangement was strictly determined by the attribution to the deity of human needs and by the requirements of a worship, both very secret and very pompous. This comprised two services, one private and the other public. The first consisted in homages and in properly domestic attentions

rendered to the master daily in his private apartments by his servants the priests, and on extraordinary occasions, in the interior of his chamber by the Pharoah or his ecclesiastical subordinate. The second was contributed on festal days by an exhibition of the shrine, offered for the admiration of the faithful and borne in procession. Frim the programme resulting, the religious architecture of Egypt understood how to i introduce a reality as grand as appropriate. (28, 29, 30, 33).

After the manner of Egyptian habitations, the "house of the god" turned its back to the exterior. And first the walls 40 ft. high isolated a vast area in the form of a rectangle. T This was entered only after following a longer or shorter time an avenue of statues of sphynxes or of rams (11, 31),[1] and passing through a gateway opened in the mass of a great rectangular tower, or rather in a wall between two towers, otherwise said to be in a "pylon" (11, 32). The defensive character of the entrance, in accordance with the idea included in the before mentioned name of "chateau of god", is notably emphasized at the Temple of Ramses III at Medinet Habou, where it is formed by a little castle in the manner of Syria, commemorating the campaigns of the prince in that country (100). In the midst of gardens, beautified by kiosks and water basins and where a sacred lake extended, rose the divine palace. As much as that of the sacred area, its seclusion was absolute. Of its four facades arranged on the sides of a rectangle [2] and theoretically orientated according to the cardinal points, practically with reference to the course of the Nile, regarded as flowing accurately from south to north, three were blind -- the two lonber and one of the shorter sides; the fourth opposing to the visitor the majestic severity of a lofty pylon. [3] as the jealous guardian of a portal relatively low and narrow. Before it rose as enseigns two obelisks; frequently also colossal statues as guards, and against the facade itself were high masts bearing streamers and retained by wooden timbers projecting from slots.(32, 12, 13).

Note 1. At Karnak the principal avenue connecting the Temple of Amon with Luxor measured 1.25 miles with a width of 75.5 ft., the intervals between the sphynxes aberaging 13.1 ft.

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Note 1. At Karnak the original avenue connecting the Temple of Amon with Luxor measured 1.85 miles with a width of 76.5 ft., the intervals between the sphynxes averaging 13.1 ft.

Note 2. Here are some dimensions: Temple of Amon at Karnak, 1200 x 328 to 377 ft.; Temple of Luxor, 858 by 121 to 206 ft.; the Ramesseum, 525 by 164 ft.; Temple of Medinet-Habou, 492 by 157.5 ft.; Temple of Khons at Karnak, 243 by 91.8 ft.

Note 3. That of the Temple of Amon at Karnak measured 370 ft. in length and 142.5 ft. in height.

Having passed the doorway, one finds himself in a vast court [1] bordered sometimes on the sides only, sometimes on the front also, by porticos generally single but sometimes doubled, as the case at the Temple of Khons and the Ramesseum (51, 54, 65); an altar occupies the centre. At the rear and at a level above that of the court occurs a vestibule accessible by a ramp or a flight of steps; at first this was merely a portico of greater or lesser depth; in the Ptolemaic epoch, it became an actual hall enclosed in front by the wall at half the height of the front intercolumniations, examples of which are presented by the Temples of Edfou, Denderah and Kom Ombo. (30, 1, 2; 43, 44, 66).

Note 1. At the Temple of Amon at Karnak, the great court measures 276 ft. in depth for a width of 338 ft. At the Temple of Luxor, the corresponding dimensions were for the first court 187 by 167 ft., and for the second court 148 by 167 ft.; at the Temple of Medinet-Habou, 125.5 by 138. ft.

From the vestibule through an opening in its rear wall, one entered a great nave, dimly lighted, its ceiling supported by a quincunx of columns. That of the Temple of Amon at Karnak is the most complete realization and occupies an area of 55, 53,822 sq. ft., being 170.6 ft. deep by 338 ft. wide, and it raises to 75.5 ft. the ceiling of its three central aisles,[1] and to 42.7 ft. those of the side aisles.(29, 3; 31). The purpose of this columnar hall was sufficiently defined by the names of "broad hall", "assembly hall" and "hall of the apparition", given to it by the Egyptians. It was properly the throne hall of this divine palace, into which on festal days crowded the faithful, to adore the god after leaving his apartments in his boat on the shoulders of the priests.(44). At the middle extended on the general axis of the edifice an aisle wider and higher than the others, leading to a doorway a

almost always closed, the access to the "mysterious and occult halls", otherwise termed the private habitation of the deity. This dwelling comprised two parts; at the centre being the holy of holies or hall of the boat, a rectangular room, narrow and deep, the lodging of the divine image, which was sheltered in a shrine placed on a boat; on each side were cells for use as sacristies, treasuries and storerooms.

Note 1. Olympeion of Akragas, 67,788 sq. ft.; Cologne Cathedral, 66,348 sq. ft.; S. Peter's Church in Rome, 163,122 sq. ft.

Excepting in the vicinity of the doorways, light was scarce, sparingly filtered through small openings made at the junction of the walls and ceiling, or narrow slits made in the roof; in the central aisle of the columnar hall, it was sifted through stone open work, that filled the space between the covering of the side aisles and that of the higher nave.(42,2).

Note 1. These screens were stone slabs pierced by slots, whose width does not exceed 10 ins.

In the Egyptian fashion, the master of a divine mansion utilized its terraced roofs; easily accessible by straight or winding stairs, these supported shrines -- equivalents of the porticos and pavilions placed on the roofs of the dwellings of men -- and even oratories like that, which on the lower t terrace of the Temple of Denderah contained a quincunx of 12 columns.

Finally numerous and important, in accordance with the dignity of the lord of the place, outbuildings gathered around the "palace"; lodgings for the priests and servants, granaries, cellars and stables, characteristic examples of which have been preserved to us by the Ramesseum.

Such was the formula of the Egyptian temple in its essential traits. It is found again in the variations caused by a complication of the plan here, there an extension or reduction of proportions, elsewhere an adaptation to particular topographical conditions.

That is, at first differences due to additions. If a temple was common to a triad of the god, his wife and their son, or to a group of several deities, the holy of holies was divided

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into as many cells as it possessed inhabitants. Two are counted at Kom Ombo, three in the Temple of Khons at Karnak, and seven in that of Seti I at Abydos. In this case the subdivision also affected the state apartments; at Kourna three doorways were formed in the wall of the vestibule; at Kom Ombo, everything was doubled from the pylon. (33).

Sometimes, -- examples are seen at the Temple of Seti I at Kournah and at Abydos -- besides a sleeping chamber and closets, the domestic lodging comprised a small columnar hall flanked by little rooms.

56 The epoch of the XX dynasty introduced a complication in the arrangement of the sanctuary, of which the Temple of Khons presents an example, and that the Ptolemaic period employed, not only in its own edifices but also in several of the preceding epoch. [1] It emphasized the secrecy of the holy of holies by making that a cell entirely isolated in the centre of the sanctuary by a corridor connecting with its subordinate rooms. [2] (28, 5; 30).

Note 1. See Temples of Amon at Luxor and Karnak.

Note 2. See page 41 and Fig. 22, 14, an analagous development in the plan of the tomb.

As peculiarities of arrangement may still be cited -- notably at the Temple of Deir el Bahari and in that of Dendera -- the existence of little courts enclosing an altar or a kiosk, and that a specimen presented by Dendera, of crypts in the f form of galleries in stories beneath the ground in the thickness of the walls, and accessible by stairways or by trap doors placed in the pavement. (30, 3).

Nothing was easier than the amplification of a palace of t the god. Like that of a sovereignit made an impression by t the portion intended for display, which was always susceptible of enlargement. It sufficied to set columns in the court and to cover it, in order to double the columnar hall, repla-
57 ced by restoring the suppressed court before the original facade. To that operation repeated several times, the great Temples of Luxor and of Karnak owe their length and the complexity characterizing them.

Inversely, without ceasing to fulfil the programme, the temple might be reduced to the proportions of a modest oratory.

Thus at Deir el **Medine** that of Hathor, whose length does not exceed 164 ft., successively offers within the portal a miniature of the columnar hall on two detached supports; separated from them by two columns connected to the walls by a high parapet is a raised vestibule; finally a sanctuary composed of a holy of holies, a treasury and a sacristy. (28, 4; 66).

Finally, if a rise of the ground became an obstacle to the development of the normal plan, the Egyptian architect did not hesitate to substitute for the ordinary arrangement a landing, one in steps, just entirely as if it concerned a funerary dwelling, to bury part or all of the edifice in the slopes of a mountain. So in Nubia, the solution was imposed by the form of the valley, closely hemmed in by the riverside h hills.

As examples of temples half subterranean (hemispeos) may be cited at Deir el Bahari the funerary Temple of Thoutmosis III and of Hatshepsouet, and the "House of Ptah" at Gerf Houssain. (36, 1, 2, 3). The first of these monuments was almost entirely under the open sky; its lower terrace formed a square, the middle terrace was a court; the landing crowned by the p porticos of Pount and of the Birth were the vestibule; the upper platform, formerly bearing columns and covered, was the columnar hall; the sanctuary alone was enclosed within the r rock. At Gerf Houssein a square of 45.0 ft. was likewise subterranean, and the court enclosed by porticos was alone a structural work.

As for the subterranean temple (speos), the Great Temple of Ipsamboul presents a model realization. Nothing is wanting in the canonical arrangement; a terrace cut in the rock simulates the square; the surface of the rock is cut in the form of a pylon with a portal; passing this one finds himself in a hall 58 ft. deep and 54 ft. wide, whose eight pillars were reserved in excavating, and it forms a court with porticos; there is a columnar hall with four columns and measuring 24.6 × 36.1 ft.; finally a sanctuary is accessible with three doorways, and it has three sacred chambers for Amon, Ptah and Harakte; treasuries and storerooms flank the whole, which from the threshold to the rear measures no less than 180.5 ft.(36, 4; 35, 13).

As he arranged for himself the dwelling for his worshippers, the Egyptian god adapted for himself their summer shelter, t the kiosk. From this indeed was derived the temple termed peripteral, a small structure,[1] specimens of which are known to us from the XVIII dynasty (28, 7; 14; 34). At the middle of a rectangular platform on a substructure of moderate height, accessible at one of its ends by a flight of steps, stood a narrow sanctuary around which extended an open gallery on piers or columns; in the Ptolemaic period the lower portion of the intervals was closed by a parapet. The sacred enclosure represented the court, while the surrounding portico took the place of the vestibule and columnar hall. Sometimes the lodging of the god was reduced to one chamber, as at the little Temple of Amenophis III on Elephantine; sometimes it was 59? disposed in several halls in a series, as at the Chapel of t the Birth adjoining the Temple of Isis on the island of Philae; occasionally, as at the peripteral structure of Thoutmosis III at Medinet-Habou, it was completed by outbuildings at the rear.

Note 1. At the little Temple of Elephantine, the sanctuary measures 39.4 by 31.1 ft., and the platform is 7.4 ft. above the ground.

60 Chapter 4. Construction.

Egyptian construction reveals a spirit of enterprise and sequence, a simplicity and ingenuity, that compel our admiration. It recoiled from no problem and many solutions proposed by it were elegant.

In spite of negligences and of irregularities, of mistakes attributable in large measure to the enormity of the demands and to a system of labor directly under the government, it p possessed to the highest degree a taste for beautiful materials, the feeling for and the means for perfect execution. It is wrong to have taxed it with timidity, and for its works to have been criticised for excess of strength and massiveness. It certainly was never economical of material; but the volumes given to the members of an edifice in general were in proportion to the work imposed thereon by the realization of the programme, and one could say of the great nave at Karnak, that "it gave evidence of boldness comparable to that of the Greeks".

I. The Materials.

Egyptian construction long employed merely the mud of the Nile, spread on a lattice-work of reeds or of palm ribs, and until the end, earth remained the preferred material, when it was required to erect a house, a palace, a fortress, a tomb, or even a temple.[1]

Note 1. For example, see the Palace at Tell el Amarna, the forts at Abydos, Semneh etc.: the mastabas of Saccara, the p pyramids of Dachour, of Licht and of Illahoun: at Karnak the chapels of Peteneit and of Sheshonk. See the Sarcophagus of Mycerinus, the model of a house of wood and crude bricks.

It utilized this mud moulded in squares and dried in the sun. The bricks from the time of the Ancient empire were rougher and mediocre, made of a mixture of mud, sand and gravel; they were rectangular and rather small.[2] Then the manufacture was perfected at the same time the size was increased.[1] Mixed with chopped straw or with the residue from threshing grain, Egyptian mud acquired in drying a durability and a remarkable consistency.(37).

Note 2. Averaging 8 3-4 to 10 1-4 ins. long, 4 3-8 to 5 1-8 ins. wide and 2 3-8 to 3 1-8 ins. thick.

Note 2. Length 14 1-4 to 15 3-8 ins., width 7 1-8 to 7 1-2 ins., thickness 4 3-8 to 4 3-4 ins.

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It is no less true that the Egyptians had a weakness for g great blocks. In the time of the II dynasty, there were cut for the Tomb of Nofir Ka at Zaouyet el Aryan slabs of granite of more than 389 cu. ft. volume; the epoch of the great pyra-mids commonly quarried in the same material blocks 16.4 to 23.0 ft. long and 4.9 to 8.2 ft. wide. There exists and dat-es from the reign of Amenophis III a shaft of a column in ro-se granite measuring 13.9 ft., and another, marked by the car-touche of the last king of the XVIII dynasty, whose length a attains 21.3 ft.; in the ceiling of the columnar hall of Kar-nak are architraves 31.2 ft. long, 6.5 ft. wide and 4.9 ft. deep, and their volume may be estimated at 109.2 cu. ft. and their weight at 71.5 tons; the great pylon of the same Temple, a Ptolemaic work, exhibits a lintel of 26.3 ft. Likewise the cutting of these monsters was play for the men, who cut out in rose granite, transported from Assouan to Karnak and erec-ted without accident monolithic needles 105 ft. long! [1]

Note 1. That is the height of the obelisk of S. John Late-ran at Rome. One of those that queen Hatshepsouet caused to be erected in the Temple of Karnak, and which is still in pl-ace, measures 100.7 ft. with a side of 8.7 ft. at the base.(12).

To avoid the risk of injury in the course of the journey a and the setting, the stones reached the works merely roughed out, excepting on their lower beds and ends. After setting in place the tops were leveled and a chamfer indicated the b borders of the external face; after completing the construct-

into as many cells as it possessed inhabitants. Two are counted at Kom Ombo, three in the Temple of Khons at Karnak, and seven in that of Seti I at Abydos. In this case the subdivision also affected the state apartments; at Kourna three doorways were formed in the wall of the vestibule; at Kom Ombo, everything was doubled from the pylon. (33).

Sometimes, -- examples are seen at the Temple of Seti I at Kournah and at Abydos -- besides a sleeping chamber and closets, the domestic lodging comprised a small columnar hall flanked by little rooms.

56 The epoch of the XX dynasty introduced a complication in the arrangement of the sanctuary, of which the Temple of Khons presents an example, and that the Ptolemaic period employed, not only in its own edifices but also in several of the preceding epoch. [1] It emphasized the secrecy of the holy of holies by making that a cell entirely isolated in the centre of the sanctuary by a corridor connecting with its subordinate rooms. [2] (28, 5; 30).

Note 1. See Temples of Amon at Luxor and Karnak.

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As peculiarities of arrangement may still be cited -- notably at the Temple of Deir el Bahari and in that of Dendera -- the existence of little courts enclosing an altar or a kiosk, and that a specimen presented by Dendera, of crypts in the f form of galleries in stories beneath the ground in the thickness of the walls, and accessible by stairways or by trap doors placed in the pavement. (30, 3).

Nothing was easier than the amplification of a palace of t the god. Like that of a sovereignit made an impression by t the portion intended for display, which was always susceptible of enlargement. It sufficied to set columns in the court and to cover it, in order to double the columnar hall, replaced
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Thus at Deir el **Medine** that of Hathor, whose length does not exceed 164 ft., successively offers within the portal a miniature of the columnar hall on two detached supports; separated from them by two columns connected to the walls by a high parapet is a raised vestibule; finally a sanctuary composed of a holy of holies, a treasury and a sacristy. (28, 4; 66).

Finally, if a rise of the ground became an obstacle to the development of the normal plan, the Egyptian architect did not hesitate to substitute for the ordinary arrangement a landing, one in steps, just entirely as if it concerned a funerary dwelling, to bury part or all of the edifice in the slopes of a mountain. So in Nubia, the solution was imposed by the form of the valley, closely hemmed in by the riverside h hills.

As examples of temples half subterranean (hemispeos) may be cited at Deir el Bahari the funerary Temple of Thoutmosis III and of Hatshepsouet, and the "House of Ptah" at Gerf Houssain. (36, 1, 2, 3). The first of these monuments was almost entirely under the open sky; its lower terrace formed a square, the middle terrace was a court; the landing crowned by the p porticos of Pount and of the Birth were the vestibule; the upper platform, formerly bearing columns and covered, was the columnar hall; the sanctuary alone was enclosed within the r rock. At Gerf Houssein a square of 45.0 ft. was likewise subterranean, and the court enclosed by porticos was alone a structural work.

As for the subterranean temple (speos), the Great Temple of Ipsamboul presents a model realization. Nothing is wanting in the canonical arrangement; a terrace cut in the rock simulates the square; the surface of the rock is cut in the form of a pylon with a portal; passing this one finds himself in a hall 58 ft. deep and 54 ft. wide, whose eight pillars were reserved in excavating, and it forms a court with porticos; there is a columnar hall with four columns and measuring 24.6 × 36.1 ft.; finally a sanctuary is accessible with three doorways, and it has three sacred chambers for Amon, Ptah and Harakte; treasuries and storerooms flank the whole, which from the threshold to the rear measures no less than 180.5 ft.(36, 4; 35, 13).

As he arranged for himself the dwelling for his worshippers, the Egyptian god adapted for himself their summer shelter, t the kiosk. From this indeed was derived the temple termed peripteral, a small structure,[1] specimens of which are known to us from the XVIII dynasty (28, 7; 14; 34). At the middle of a rectangular platform on a substructure of moderate height, accessible at one of its ends by a flight of steps, stood a narrow sanctuary around which extended an open gallery on piers or columns; in the Ptolemaic period the lower portion of the intervals was closed by a parapet. The sacred enclosure represented the court, while the surrounding portico took the place of the vestibule and columnar hall. Sometimes the lodging of the god was reduced to one chamber, as at the little Temple of Amenophis III on Elephantine; sometimes it was disposed in several halls in a series, as at the Chapel of t the Birth adjoining the Temple of Isis on the island of Philae; occasionally, as at the peripteral structure of Thoutmosis III at Medinet-Habou, it was completed by outbuildings at the rear.

Note 1. At the little Temple of Elephantine, the sanctuary measures 39.4 by 31.1 ft., and the platform is 7.4 ft. above the ground.

60 Chapter 4. Construction.

Egyptian construction reveals a spirit of enterprise and sequence, a simplicity and ingenuity, that compel our admiration. It recoiled from no problem and many solutions proposed by it were elegant.

In spite of negligences and of irregularities, of mistakes attributable in large measure to the enormity of the demands and to a system of labor directly under the government, it p possessed to the highest degree a taste for beautiful materials, the feeling for and the means for perfect execution. It is wrong to have taxed it with timidity, and for its works to have been criticised for excess of strength and massiveness. It certainly was never economical of material; but the volumes given to the members of an edifice in general were in proportion to the work imposed thereon by the realization of the programme, and one could say of the great nave at Karnak, that "it gave evidence of boldness comparable to that of the Greeks".

I. The Materials.

Egyptian construction long employed merely the mud of the Nile, spread on a lattice-work of reeds or of palm ribs, and until the end, earth remained the preferred material, when it was required to erect a house, a palace, a fortress, a tomb, or even a temple.[1]

Note 1. For example, see the Palace at Tell el Amarna, the forts at Abydos, Semneh etc.: the mastabas of Saccara, the p pyramids of Dachour, of Licht and of Illahoun: at Karnak the chapels of Peteneit and of Sheshonk. See the Sarcophagus of Mycerinus, the model of a house of wood and crude bricks.

It utilized this mud moulded in squares and dried in the sun. The bricks from the time of the Ancient empire were rougher and mediocre, made of a mixture of mud, sand and gravel; they were rectangular and rather small.[2] When the manufacture 61 was perfected at the same time the size was increased.[1] Mixed with chopped straw or with the residue from threshing grain, Egyptian mud acquired in drying a durability and a remarkable consistency.(37).

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construction, this draft served to guide the surfaces. Every time they took the trouble, Egyptian stonecutters realized m marvels of accuracy and finish.

The Egyptian constructor was acquainted with plaster of paris, but he prepared it very crudely and employed it mixed w with sand. From a mixture of lime and sand, sometimes with the addition of pounded bricks, he knew how to obtain a mortar of good quality, sometimes very hard and adhesive.

II. The Methods.

The miraculous preservation of parts of the tombs of the I dynasty, notably that of Qua at Abydos, reveals to us how the carpenters of primitive Egypt constructed a wooden wall by i inserting the verticals and planks in the mortises of a sill, that they embedded in the still wet mud of the soil. (42, 1).

As revealed by the remains of articles of furniture, representations painted or sculptured and also certain decorative forms of architecture in stone, models of structural arrangements executed in wood, Egyptian carpentry appears very expert.
64 It practised our present system of connecting by dovetails, by tenons and mortises, by housing and by concealed dowells. It had organized ingenious procedures for the consolidation of a structure, in the first rank of which must be mentioned the triangular arrangement, with stiffening by diagonal members; this was currently employed when the dimensions were small (38); but as soon as these were enlarged, the defect of rigidity limited it to the inferior system of square framing and to the twofold necessity of placing the posts closer and of increasing the number of cross beams. (40).

The Wall.

The Egyptian masonry associated in a surprising manner minute precautions and astonishing negligences. As a type of the latter may be cited the general inefficiency of the foundations. However considerable might be the weight of a monument, its substructure scarcely extends into the ground, but again this was little or not at all required. Thus at the T Temple of Seti I at Abydos, it was reduced to a single course of badly balanced blocks; the gigantic columns of the columnar hall at Karnak have as foundations wretched masses of rubble, whose section is sometimes less than their own. At the

Temple of Luxor, under the more exposed parts because of the vicinity of the Nile, it is well if one can count three courses, each one 2.6 ft. high. The Ramesuueum offers the example of a support of a species of mass of dried bricks about 6.6 ft. thick. Not before the Ptolemaic period are found foundations extending 16.4 to 19.7 ft. into the ground. But on the other hand, the Egyptian column possessed in the large d disk serving it as a base a footing more than sufficient. Normally preparation was limited to leveling the area of the future edifice and compacting it by means of ramming. In truth, once dried and piled, the humus of the valley of the Nile acquires a remarkable incompressibility, and the fact that it is ordinarily placed on a layer of mud did not connect it with deep excavations. Indeed from other expedients the Egyptians demanded the stability of their structures.

Executed in bricks, Egyptian masonry employed dried squares and comprised between the courses a bed of pasty clay, pure or mixed with straw, whose thickness averaged 3/8 inch. Sometimes -- thus at the pyramids of Dachour and of Haoura -- men substituted for this a layer of sand, very suitable to ensure at the same time the equal distribution of the loads and the drainage of the structures; or again this was a mattress of alfa grass, often made into a mat.(39, 5). The part of tie played by it was held at other times by anchors of joists or of trunks embedded in the mass. It was not rare for the vertical joints to be left open, a peculiarity also favorable to drying. Ordinarily bricks were set flat in lines across the wall. At different heights were constructed leveling courses by means of tiles, generally set vertical but sometimes inclined more or less, in proportion to the corrections in leveling important to make. (39, 2, 3, 4).

On a soil like that of Egypt, a wall in crude bricks is exposed to several sorts of deterioration. During the period of the inundation, it is saturated during the day by vapors issuing from the heated earth, and in the night is swelled by the water produced by their condensation; when that abates, it cracks and splits by the successive contractions in drying. Besides, the moist clay being soapy, it suffices for a course to be slightly inclined for a slipping of the mass supported

by it to occur; such an accident further menaces stone masonry on a clayey footing. Common likewise to the two kinds of construction are the risks of settlement in consequence of an undermining of the subsoil saturated with water. Against these various perils, the Egyptian architects protected themselves by the aid of one of those expedients, both simple and ingenious, to which they were accustomed. [1]

Note 1. We borrow this explanation from the work of A. Choisy on Egyptian construction.

They first divided the length of the wall into sections absolutely independent, alternately long and short. Each one of the first exceeded the alignment of the second, and its c courses were concave, while for the two collateral bays the longitudinal outline was horizontal or convex. The advantages of the system were evident; the division of the wall ensured to it a certain elasticity and localized the movements; the curvature of the courses opposed slipping by forming at regular distances a stop fixed in a sort of notch in the ground.(41). [2]

Note 2. See in volume II an analagous system in Japanese construction.

For injuries that might be caused on the structural surfaces in crude bricks by the rain, the wind, or contact of men, these were prevented by the application of coatings, woodwork, mats and protectors made of reeds. [1]

Note 1. See the paneling in the interiors of several protohistoric tombs; the representations of edifices on the reliefs and paintings, and certain decorative forms retaining the memory of structural forms. (further, see page 82).

The construction in stone materials proceeded with open joints and without connection by mortar. Sometimes -- thus at the columnar hall of Karnak and on the Temple of Seti I at A Abydos -- it united two blocks adjoining in the same course by the aid of cramps made in dovetail form in sycamore wood. Each time that circumstances permitted, perfect contacts were realized. According to Herodotus, the facing of the Great Pyramid was "so well fitted", that the entire covering appeared to be a single block". His statement deserves credit from t the excellence of the masonry shown by the Tomb of Nefer Ka

(II dynasty), certain funerary chapels contemporary with the III dynasty, the base of the Pyramid of Mycerinus, the Temple of Granite, or even the grand gallery of the Pyramid of Cheops, the last being so remarkable, that to use the expression of the Arab Abd-ul-Latif, "one could insert into the joints neither a needle or even a hair!"

Egyptian architecture had too much feeling for the beautiful to not desire it and too much power to not realize -- whenever the conditions were favorable -- the regularity of beds, verticality of joints and equality of courses. But too frequently for economy it was compelled to not only resign itself to variations from level, but even to accommodate blocks of irregular shape, left to correct defects by filling with small stone chips, fitted or set in mortar. From the New Theban empire the question of appearance of the construction was simplified, because of the system of covering the entire surface of a wall or of a column by figures or inscriptions, which i introduced the necessity of a facing of stone suitable for carving or of a coating of stucco.

At all times, the Egyptians practised the economical system, that realized a mass by means of a constructed shell, the void being filled with sand, mud or gravel.(39, 6, 7). A stone
68 wall was always constructed with two independent faces. If its height were small, these were placed against each other; as soon as this bacame considerable, they were separated from each other, that of the internal side being vertical, while the exteroal rose with an inclination attaining even to one tenth the height; in the case of a pylon, both were inclined.[1] As for the void, it was filled with stone chips and even with sand; a detestable practice, since a breach in the shell permitted an escape of the filling, and the oblique facing was overbalanced and fell. The same principle appeared in the construction of great columns. Thus at Luxor each drum was m made of a ring of several blocks, the central hollow being f filled with mortar and pounded bricks.

Note 1. This inclined elevation was constantly employed by Egyptian construction -- doubtless because in was seen an element of stability -- and evidently was derived from that given by the example of the dykes of the valley.

The ordinary cap of a window opening was a lintel of stone or of wood, according to whether the construction was of stone or of bricks, and which was supported either by the parts of the wall next the opening or by the inclined jambs. Rarer but not exceptional was the form of the arch.

The Site and its Covering.

For the site of a modest structure, the Egyptian architect was satisfied with tamped mud. If it concerned an important edifice, there was established either a bed of bricks covered by a layer of mortar or a floor under a coating of plaster, placed on timbers isolating from the earth, venerable remains of which are offered by the tombs of the first dynasty; or again a pavement of perfectly jointed stones, or finally a layer of enameled tiles. At the Palace of Amenophis IV at Tell el Amarna were superposed from bottom to top a bed of bricks, a layer of mortar from 1/2 to 1 inch thick, finally another -- very thin -- of gypsum mixed with fibrous materials, which was painted, then polished and made impermeable.

For the problem of the covering, the Egyptians proposed various solutions. The earliest in date doubtless utilized reeds or rushes curved to form rough outlines of trusses (28,1), whose images have been preserved to us by the canopies of historical Egypt.(42, 4). Then the ceilings were made of round palm trunks or of timbers cut from more resistant woods; after having placed on them a mat of interwoven reeds, they were covered by a layer of clay well settled, which contained a l ledge formed by an offset of the wall,or by a course of bunches of reeds.(49, 3).

Yet quite early, at least from the epoch of the II dynasty as proved by the Tombs of Naga ed Der, Egyptian construction in bricks knew how to realize the covering by means of a vault. To the system of the tunnel vault it first had recourse, for which its preference was already marked; but it also utilized that of the dome.(42, 7).

In the application of both was readily employed the method of corbelled courses; it further knew how to select for constructing them the pointed curve, the most practical of profiles, and arranged to avoid the scaffolding, difficult in a country poor in wood.

Soon even -- the tombs of Bet Khallaf and of Requaquah, contemporary with the III dynasty, furnish the proof of this -- it understood how to arch a half cylinder by the method of radial courses, doubtless modeling in earth the form to support the ring under construction.(42, 15, 16). In truth, these primitive tunnel vaults were rough, irregular, and their span was quite small. That closing the corridor of the Tomb of Nefer Khat does not exceed 4.1 ft. in clear width. The m materials were ordinarily the same as for the walls, the angular crevices at the outside of the crown being stopped by a filling of clay. Sometimes instead of the tiles were employed true voussoirs, their trapezoidal form bein produced either by the addition of two wedges of mud to the sides of a still wet normal brick, or by the removal of two flakes at the sides of a dried brick.

71 Yet the method of construction by rowlock arches obtained favor in Egypt; indeed it was most appropriate for the natural conditions of the country, since it required no centres. (42, 9, 10, 11). Various artifices facilitated its application; walls were carried as high as possible by corbelling out their upper portions; for the vault were employed thin tiles,[1] sometimes slightly curved lengthwise, with two or three grooves on their lower surfaces to favor the adhesion of the mortar; the arches were inclined against a backing wall; several shells were superposed, even four; finally sections comprising the least difficulties were chosen, the pointed arch, the segmental arch, and especially an ellipse with three centres corresponding to a group of two right-angled "Egyptian" triangles with their smaller sides adjoining.(42, 10, 11).

Note 1. At the storehouses of the Ramesseum, they were 2 ins. thick, 11 3-4 ins. long and 5 7-8 ins. wide.

The most ancient known example of this type of tunnel vault is offered by an oblique tunnel vault in a tomb at Dendera, that of Adou I, director of the works of the Pharoahs Pepi I and III of the VI dynasty; it is a circular arch composed of the superposition of four rings. The most remarkable are seen in the storehouses of the Ramesseum; the four arches are connected, 11.8 ft. wide and extending to 15.3 ft. above the ground.

Resistance to thrust was ensured by the thickness of the walls, which attained 12 ft. at the Ramesseum.

Note 2. The right-angled triangle denominated by the ancients "Egyptian" or "sacred" is distinguished by the peculiarity, that its sides are to each other as 3, 4 and 5.

For stone construction, the ordinary system of covering was a ceiling of slabs set on the walls and on the architraves of the colonnades.(42, 2). The span was sometimes reduced by an enlargement of the upper part of the wall (42, 6; 43); thus is it at the sanctuaries of the Temple of Seti I at Abydos. (42, 5). If it was exposed to pressure, it was protected by the artifice of a discharging arch, such as shown by the chambers of the great pyramid and one of the corridors of the Temple of Deir-el-Bahri.(42, 8).

Yet the vault in stone was not exceptional. Sometimes it sprung from a corbelling of the upper courses of the two opposite walls, the offsets being either well preserved -- as in the grand gallery of the Pyramid of Cheops -- or properly cut according to a circular arc, as in the previously mentioned corridor of Deir-el-Bahri. Sometimes it was formed by the meeting of two rows of slabs of equal height set on the tops of the walls and inclined toward each other; sometimes for greater security, this arrangement was doubled or trebled. As examples we will cite the ceiling of the "queen's chamber" in the Great Pyramid and that of one of the cells above the royal chamber; the covering of the chamber of the Pharoah Ounas (V dynasty) in his Pyramid of Saccara; the discharging v vault of the previously mentioned gallery of Deir-el-Bahri.((42, 13, 8). More rarely it was a tunnel vault constructed on forms, at first with rectangular blocks fitted at the outside with stone chips, and from the Saitic epoch with trapezoidal voussoirs. (42, 17).

In brief, from a very early period Egyptian construction h had at command the varied and practical means, and its productions possessed in the highest degree the essential quality of stability. With its inclined walls pushing toward the interior, its thick ceilings strongly stayed by the equilibrated pressures of the four walls, its columns fixed at the bases by the pavement and at the tops by the load of the architrave,

an Egyptian edifice carefully built in stone should endure as long as the ground does not yield beneath its basis.

Chapter 5. The Effect.

Voewed in regard to the effect, Egyptian architecture reveals a very vivid taste and a very assured sense of the matter; at the same time a certain knowledge and a moderate research in the beauties of harmonic order; on the other hand an intense exploiting of all that could please the eye and strike the imagination; the passion for and the science of adventitious ornament, a remarkable appropriateness of invention to the conditions of the place and the purpose; finally the skill of the decoration and the perfection of the execution.

I. Effects of Harmonic Order.

When it concerned the arrangement of an entirety or the proportioning of the parts of a whole, Egyptian esthetics left entire liberty, on this side of the limits set by the necessity of satisfying the eyes.

It was inspired by regularity and symmetry. However developed might be a temple, however numerous had been the additions to the original plan, it was no less rigorously arranged about an axis, from its most distant approaches as far as the holy of holies. On each side of the central avenue traced on the one hand by the succession in a straight line of the preliminary avenue of the sphynxes or rams and the different gateways; on the other by the enlargement of the middle intercolumniation of the portico vestibule and of the middle aisle of the columnar hall, balanced each other, equal in the relative number and dimensions and similarly arranged; the sphynxes, obelisks, succession of pylons, colossal statues set against their fronts, and the masts bearing flags, areas of the courts, extent of the halls, groups of isolated supports and series of chambers and small cells. Even the drawing of a garden was entirely geometrical, and the right line reigned despotically there.(20).

It was always necessary for a system to be absolute; yet E Egyptian architecture sought the appearance of regularity rather than the reality. In truth, nothing is more rare in its productions than an exact balance of outlines and additions, an entire equality of two corresponding dimensions, an absolute parallelism of two walls or of two opposite rows of columns.

Even more, Egyptian architecture nowise objected to impose different aspects, not only on monumental parts in sequence, but even on elements of the same species grouped in a series. Thus it did not fear to arrange a court colonnade with porticos of different forms,[1] and that it did not hesitate to group together several types of isolated supports.[2]

Note 1. For example, those of the second court of the Temple of Ramses III at Medinet Habou present, the eastern and the western Osiris piers, and the other two have papyrus bud columns (54); a contrast still more significant in the first court of the same edifice, where a row of columns of papyrus form faces one of seven piers.

Note 2. Thus at the portico vestibule of the Temple just cited, from the exterior a row of Osiris piers and of papyriform columns succeed bud columns; at the Temple of Karnak, t the columns in four rows of the walk of Thoutmosis is so arranged, that an enclosure of piers surrounds a nucleus of columns, and in the columnar hall the capitals of the columns are bell-shaped beneath the ceiling of the great nave and totiform under that of the side aisles. Finally, certain porticos of the time of the Ptolemies -- an example of this may be seen in the first court of the great Temple of Isis at Philae -- exhibit as many varieties of capitals as there are columns.(65).

Egyptian architecture never applied the principles essential to Grecian art, of fixed proportions in the same arrangement and of the dependance of all dimensions upon one of these, chosen as the unit. There is no more constancy in the ratio of solids and voids than in that of one part to the others or to the whole. In the same edifice and even in the same portico, supports exactly similar are placed at different intervals; two examples of the same type and the same diameter have very different heights; two pairs of columns absolutely similar support architraves of very unequal heights. In brief, Egypt never conceived the necessity of "orders"in architecture more than that of a fixed metre in poetry.

This is not to assert that the architects on the banks of the Nile were ignorant of the harmonic virtues of members; on

the contrary, they early appreciated the esthetic advantages of commensurate dimensions, of simple relations and of outlines conformed to certain general constructions. Evidently it is not the effect of chance -- omitting negligible fractions on account of the importance of the dimensions, that expressed in cubits the heights of the great pyramids of Gizeh, or of that of Snofrou at Meidoum, and their perimeters at the base are figured in ratios common to all; that the measures of the little destroyed Temple of Elephantine reveals the divisibility of the facade into three stories of the same heights, respectively corresponding to the substructure, to the row of shafts of the peristyle, and the entabalature, and also that of the last into three equal zones; that the dimensions of Egyptian bricks tend to be governed by the ratio of 2 to 1, the length being the double of the width, that in its turn contains twice the thickness; that a table of rows of i isolated supports of ceilings, porticos or halls, reveals a marked preference for the number 6, its multiples and factors. It is no less significant, that as the basis of many arrangements is discovered a geometrical relation, such is the relation of the height of the pyramids mentioned to the sum of t their sides at the base and that of the radius to the circumference; such again is the possibility of inscribing in a number of outlines a triangle or of two placed against each other, and more particularly of the right-angled triangle, whose sides are to each other as 3, 4 and 5, etc. [1]

Note 1. On the use of the "Egyptian triangle", see in Volume 2 of this history the section devoted to effect in our study of Sassanian architecture.

76 II. Effects of picturesque or affected character.

To a very high degree and very early, Egyptian architecture desired to ensure to its productions the advantage of admiring astonishment and of sometimes overwhelming emotion, by which men found themselves affected by the spectacle of the material grandeur, that manifested itself from protohistoric t times by the removal of 217,700 cu. ft., the volume of the e excavation undertaken at Zaouyet-el-Aryan for the sepulchre of the king Nofir-Ka (II dynasty), as well as the area of

129,644 sq. ft. at Saccara covered by the stepped Pyramid of Pharaoah Zozer (III dynasty).

A measure of the passion for the colossal at the end of the IV dynasty is furnished by the choice made by the constructor of the Pyramid of Cheops for the base of his monument of nearly 13.6 acres area with a volume of more than 88,220,000 cu. ft., proportions such that their perception exceeds the powers of the eye and requires an effort of thought. (9). Proofs abound of the vogue of this sort of effect until the end of the ancient history of Egypt; extension of the Temple of Amon at Karnak to make it measure 1197.6 ft. long and more than 5/8 mile in perimeter; enormous size of the columnar hall of the same edifice, whose area of 57,590 sq. ft. exceeds one third of all the aisles composing S. Peter's of Rome and the entire area of Notre Dame of Paris (45); erection of obelisks more than 98.4 ft. high; dimensions of the subterranean Tomb of Peteamenope of the Saitic epoch (XXVI dynasty) in the Theban necropolis of El Asasif, which measures in length 863 ft. with an area of 24, 371 sq. ft., etc.

Indeed Egyptian architecture understood how to create the illusion of this material grandeur,so essential to its esthetic ideal. Its means consisted of artifices in arrangement adapted to produce some propitious optical illusions. Thus desiring advantage from the property of perspective, that diminishes the height of objects in proportion to their distance, it increased the apparent depth of a temple by arranging from the court to the most distant hall a progressive elevation of the ground and a lowering of the ceilings, such that the height of the farthest interior was scarcely more than h half that of the columnar hall.(46, 1). [1]

Note 1. At the Temple of Khons at Karnak, whose length is about 213 ft., the fboor of the sanctuary is 5.3 ft. above t that of the court.

This was doubtless not the sole merit of this arrangement in the judgement of Egyptian architects. As it favored the birth of a state of moral depression, it should in its turn produce feelings of reverence. It satisfied their great desire of strongly affecting the imagination and of arousing vi-

vivid emotions. This preoccupation with an impressionist effect is evident in several peculiarities of arrangement and construction, that are observed in the temples on the banks of the Nile, such as the repetition of the series of pylons, courts and halls, good for overpowering the mind; such was the relative difficulty of access by a small number of doorways and their narrowness in proportion to the breadth of the sites -- a difficulty yet increased from the Ptolemaic epoch by closing at mid-height the intercolumniations of the portico vestibule (44; 65; 66); such particularly was the wisely graduated lighting from the threshold to the holy of holies. (44). Dazzling in the court of honor, diminished beneath the porticos and reduced in the vestibule, the light gave place in the columnar hall to a dimness, whose mystery was even increased by some rare and slender rays falling from the clear-stories of the central aisles and the narrow holes opened in the ceilings of the side aisles; in the sanctuary reigned obscurity, that became black darkness in the holy of holies.

III. Effects of Monumental Relief.

The great effects of monumental relief were nearly foreign to Egyptian architecture. Nothing more simple, more calm than the forms of its monuments. Every plan was inscribed in the regular outline of a parallelogram and every silhouette was rectilinear; every elevation definitely sacrificed height to length; nothing but great monotonous masses and nearly solid facades, where they were not entirely blind (47).

The form of a mastaba was that of a truncated pyramid slightly battering (10 to 15 degrees), oblong and squat; its length was frequently twice its width and five times its height.

Erected on a square or slightly elongated plan, the pyramid was at first a group of seven mastabas, whose proportions diminished from one story to the next; this is revealed at Saccara by the Pyramid of Zoser, which still possesses six of t these terraces, and at Meidoum by that of Snofren, which has no more than three. That erected by the last Pharaoh at Dachour -- 699 ft. long and 324.8 ft. high -- proves that since the end of the protohistoric epoch was invented the properly pyramidal type with continuous faces inclined at about 52°,

which was magnificently realized for the buildings of Cheops, Chefren and Mycerinus at Gizeh, and remained canonical in Egypt from the IV to the XII dynasty, in Ethiopia until the Roman period. The height of these monuments was moderate; the
79 relation of height to length was at Dachour 1 to 2.1, at Saccara 1 to 2, at Gizeh 1 to 1.6. Ethiopia preferred them more slender, and at least equalized the vertical and longitudinal dimensions. An original variation is presented by the great Pyramid of Dachour (base 618.7 on each side; height 319.1 ft.), which doubtless dates from the XII dynasty; the outline is broken, as if on a mastaba with sides inclined at nearly 55° had been placed a pyramid with inclination of about 43°.

Well, the composite form appeared, affected by the New empire, notably in the region of Abydos, that of a pyramid placed on a rectangular base: at first subordinated to the point that its height generally does not exceed one fifth of the t total height, the substructure increased rapidly until the second element was reduced to the condition of a simple termination.

On account of its plan, invariably a greatly elongated rectangle, sometimes extended without measure, its moderate elevation, its battering walls, solid and plane, and finally its terrace roofs, an Egyptian temple presented the appearance of a sort of bench -- a colossal mastaba -- its longitudinal sky line being scarcely accented by the unequal altitudes of the enclosing walls, courts, outer walls of the columnar hall and those of the sanctuary.

A sole exception was formed by the temple in form of a kiosk, whose facades rise vertically and are opened like porticos.(34).

The peculiarities of monumental forms just shown are exhibited both by the fact of adaptation of the artistic creation to the natural and local conditions, and by the perfect sincerity which is one of the essential traits of architecture in Egypt.

And first they are really a reflection of those precisely characterizing the Egyptian landscape, and whose impression upon men is as strong as general: simplicity and monotony of

an outlook everywhere comprising the trinity of a river avenue in the midst of two bordering plains and two lateral bluffs; the predominance of horizontality, on the one hand the consequence of the equal flatness of the river and of the alluvial lands of the valley, and on the other of the slightly less constant level of the crest of the bluffs limiting the horizon.

On the other side, the preponderating horizontal lines, the inclination of the battering surfaces exhibit at first sight the construction of edifices covered by ceilings and consolidated by a broad extension of their bases, while the scarcity of openings announces the protection of interiors, both from excess of light and from public curiouity, so odious to the oriental. Without counting the idea of absolute stability a aroused by the appearance of these monuments widened at the base, squat and solid, exactly responds to the desire of duration, to that prepossession with the eternal, which forms one of the most characteristic traits of the mental originality of Ancient Egypt.

From this perfect accord of the general forms of Egyptian edifices with their natural surroundings; of the propriety of their conception of the house of the dead and of the house of the god, and finally from the frank manifestation presented by them, of both the programmes and of the system of construction, must be produced the primary quality of a monumental aspect; a necessary condition and in large measure a sufficient cause of beauty and of character.

IV. Effects of Secondary Relief.

With regard to the secondary effects produced by the conformation of the elements of an elevation, Egyptian architecture is always remarkable for a very varied feeling, according to whether it concerns a wall or a portico; almost entire indifference in the first case, a vivid and constant interest in the second.

Relief of the Wall.

It is doubtful if there can be a question of modeling in regard to an Egyptian wall of the historic age, in view of the little of which it was perceptible was localized at its upper

perimeter, and that its conception was that of a rare monotony.

In the time of the three first dynasties, for example, the tombs of the Thinite epoch discovered at Negada and at Nezlat= Batran -- brick construction followed a method which always prevailed in Mesopotamia,(page 142), that of recesses. On an external surface were arranged equidistant vertical recesses, separated by intervals of 8.6 to 8.9 ft., a sort of niches 5.5 to 5.9 ft. wide and 1.8 to 2.6 ft. deep; secondary recesses were frequently sunk at the back and sides, whice at the same time were hollowed out in the intermediate pilaster three grooves of rectangular section and equally spaced. This scheme -- again found in the time of the XII dynasty on the walls of the second fortress of Abydos -- offers the advantage of somewhat animating the mural surfaces, thanks to the contrasts of light and shade produced by the sunshine.

A wall of stone of the historic age was only enhanced by r relief along its lateral angles and its crest.(40). The form of the first is a great round, and of the second is a cornice formed by placing on it a torus, a cavetto and a band, presenting a characteristic example of the survival and transposition into the decorative order of a form of the structural order fallen into disuse. The angle moulding is an image of t the bundles of reeds, with which was finished the corresponding part of a structure of tamped earth most exposed to injuries, or again that of the bundles of rushes, that formed the angular framework of wattled huts. Likewise for the cornice; the first view recognized the elements of the parapet by which the mud construction supported the layer of clay of its t terraces; a series of bundles fixed at the crest of the wall with a hedge of palm ribs fixed in them and curving outwards, both under the weight of its upper portion and the thrust of the terrace of the covering. Not merely the decoration facilitates the recognition of the primitive state; for on the torus is represented a winding ribbon, recalling the fastenings of the bundles and attaching them to the wall, and the cavetto is decorated by vertical channels, which evidently are the conventionalized image of the grooves of a palisade.(49,1,2).

These mouldings render the precious service of preventing

the outline of the edifice from being lost in the dazzling i illumination of the Egyptian atmosphere. On the one hand, t the dark band formed by the projection of the angle round and especialy by the very prounounced concavit of the cavetto of the cornice; on the other the band of light sustained by the warm blue of the sky and extending along the convex surface of the moulding and on the band of the crest, marking the outlines by a double line, one dark and the other luminous. (40; 48; 67).

It is in the same spirit, that rarely in Pharaonic times b but on the contrary, frequent in Ptolemaic epoch, the band was crowned by a sort of battlement, generally composed of a series of erect serpents bearing the solar disk, or again by a row of dog-headed apes, like the case at the greater Temple of Ipsambul, where their height attains about 8.2 ft.

Within this sort of border no architectural relief accented the surfaces. It is true that in the time of the New empire, they were claimed by the scribes, sculptors and painters charged with making public the sacred images, the consecrated texts and the glory of the Pharaohs. Entirely exceptional appeared the sketches of a sculptured arrangement; such as on t the south wall of the central terrace of the Temple of Deir-el-Bahari, a design of wide pilasters scarcely projecting 3 ins.; or again presented by the external enclosure of Luxor and by the substructure of the principal Temple of Elephantine, a movement in accordance with the profile of a plinth crowned by a cornice and set on a step.

Yet for the head of a wall and for a part of a surface opposite the extremity of a row of detached supports, Egyptian architecture knew how to find the appropriate form; in the f first case that of a pier, and in the second that of a pilaster; both crowned by a cornice.(50).

Similarly from the primitive epoch, it understood how to d derive from the opening for a door or window an effect in relief, due to the method of giving to them an enclosure with form suited to the projection, a lateral extension of the lintel or support, sometimes a crowning by a high cornice.(19; 20; 48). If this concerned a portal, to it was imparted a

form truly monumental in piercing the opening in a great fac-ade, sometimes fashioned in the shape of a tower enhanced by a cornice, sometimes according to the arrangement -- known u under the name of pylon -- of a screen flanked by two high t towers. (32).

The Portico.

In contrast to the massiveness and monotony of the external aspect, the enclosure of a court was almost always richly mo-deled in porticos.(51; 65). The arrangement of these compri-sed great diversity. Sometimes -- thus at the funerary Temp-le of Seti I at Kournah -- the colonnade was limited to one of the sides of the parallellogram; sometimes -- as in the s-second court of the Temple of Luxor -- it was developed on t two of them, sometimes on three -- as on the Temple of Khons at Karnak; finally, it sometimes extended around the entire perimeter, like the first court of Luxor. There was again diversity in regard to depth; one portico was single and ano-ther doubled; sometimes the same court -- the second one of the Ramesseum presents an example -- combined the use of both types.(28 - 30; 33, 36).

Limited by the span of the stone slabs, the mode of coveri-ng imposed by the ceiling and retained by prudence, Egyptian architecture realized only rather narrow intervals between c columns; in the central aisle of the columnar hall of Karnak, they do not attain two diameters, and in the side aisles, th-ey scarcely exceed one; in the rear portico of the second co-urt of the Temple of Medinet-Habou, they are inferior to the width of the bases! It is again proper to note that from the time of the XIX dynasty -- as proved by an example recorded at the Ramesseum by the scientists of the expedition to Egypt -- and currently in the Ptolemaic epoch -- as at Dendera, Ed-fou, the portico of Nectanebos in the island of Philae, etc. -- prevailed the mode of closing the intervals by a parapet crowned by a cornice, sometimes extending to mid-height.(66).

V. Effect by Relief in Details.

The various forms impressed by Egyptian art upon the isola-ted support merit attentive study, first on account of their diversity and of their esthetic quality, as well as for the

fact that they open gloriously, with an advance of at least two thousand years, the series of satisfying realizations of this architectural member.

From the day when it produced stone construction, Egypt employed both the pier and the column, but with a very marked preference for the second. We shall successively examine the varieties of both, taking care to make their origins and evolution manifest.

The Pier.

Doubtless men commenced with the pier of square section, t the most easily realized of the forms of this type, when it was required underground to leave a portion of the rock, or above ground either to erect a monolithic shaft or a series of courses. As examples may be cited those presented at an interval of long ages by the "Granite Temple" and the little peripteral Temple of Elephantine.(52).

At an early date -- proved by many tombs from the beginning of the Ancient empire -- the necessity of ensuring to the foot a firm bearing determined the addition of a base; an illustrious example of this improvement, dating from the first half of the 16 th century, is seen in the part of the Temple of Karnak termed the "Walk of Thoutmosis III".

86 The piers of the "Granite Temple" are perfectly plain. But in all times for that excessive simplicity, the programmes s substituted a decided search for effect: for the least, that of a painting or of a carving,(53), and as much as possible, that of a sculpture. Sometimes this was reduced to the execution of a motive in low relief, such as those images of lilies and of papyrus, that are shown at Zaouyet-el-Metein by a tomb of the VI dynasty, and at Karnak by two isolated supports in the court of Thoutmosis III (52, 3); sometimes in the funerary temples of the Pharaohs -- for example, those of Medinet-Habou or of Ipsamboul (35; 54), projecting in the round or in very high relief from the front face of the pier, was a colossal statue of Osiris or of a sovereign under the attributes of that god; or again -- so at El Kab -- on the upper part of the pier was placed a mask of Hathor; or finally -- Karnak exhibits a specimen whose elements date from Amenophis

87 II -- a sort of capital springs on each of the four surfaces by a wall cornice.(53). The idea of this last addition must have come to Egyptian architects from the sight of posts surmounted by blocks, used in the quarries of Egypt for supporting the ceiling of the gallery; may not the relief effect of the subterranean tombs of Beni-Hassan have been required in the image of the sheathing of a mine?

Yet the defects of the rectangular form, that interferes w with passage and the view, must have early determined the removal of the angles.(52, 6,-10). Thus resulted a polyedric type with eaght sides, which a repetition of the already indicated procedure transformed into a shaft with sixteen surfaces; examples are found dating from the Middle empire in the necropolises of Beni-Hassan and of Assouan, and in what remains of the structures of Ousirtasen at Karnak, while others are contemporary with the New empire in the portico of Anubis, in the Temple of Deir-el-Bahari, the creation of Thoutmosis III and of Amenophis II. The square head was retained to facilitate the reception of the beam, while the foot rested on a disk of small thickness. A happy innovation was doubtless suggested by the desire of accenting the relief, and consisted in hollowing a channel in each side; the analogy of the resulting appearance to that of the shaft of the Grecian column of the Doric order explains the designation of "Protodoric" applied to it by Champollion.(52, 8). The period of the New empire was not so well inspired, when impelled by the need of surfaces susceptible of illustration, it conceived the reservation vertically below one, two, three or all surfaces of t the rectangular top of these piers, of a band more or less wide, descending more or less low, often to the foot of the
88 shaft; such may be seen in a Temple of Amenophis III at Eileithya (El Kab), in the subterranean Temple of Beit El Ouali, the work of Ramses II, and in the Temple of Kalabsche of the Roman period.(52, 10).

The Column.

But with regard to the effect, the polygonal pillar cannot rival the column, by so much less that the Egyptians loved impressions of picturesque nature, as we have observed. Indeed they conformed the isolated support to the image of actu-

actual plants -- reeds, trees and flowers -- to which it could be referred by reason of analogies of stature and of general outline. Very observant and lovers of nature; further -- as we have noted previously -- necessarily impressed by the aspect of the local landscape, they took as models the types most familiar to theis eyes, -- otherwise entirely appropriate for decorative use, -- those of the lotus, papyrus and palm.
89 A little wooden column, much employed for the light architecure of kiosks and shrines, of which actual specimens are lacking, is known to us by numerous representations, indeed more
90 or less embellished, consisted of a very slender stem like a reed decorated at the top by a relief either in the form of a flower, closed or opened, or of a bouquet, or even of several of these motives in succession; this decoration was doubtless often wrought in metal (55).

An Egyptian column always superposes four elements; a circular base of greater or lesser thickness, but always rather thin and without ornament; a shaft with diameter diminishing upwards more or less, according to the orders or the periods; a capital; finally an abacus of variable height, which in case of its greatest development extends very little beyond the perimeter of the capital, and is often reduced to the proportions of a block invisible to the observer.

So far as the present state of science permits us to go back, perhaps to the time of the V dynasty, we verify the simultaneous existence of three principal types, between which was divided the favor of Egyptian architecture, and which are respectively denominated by the distinctive appearance of either the lotus, the papyrus or the palm.

The Column of Lotus Form.

The column of lotus form is characterized by borrowing the form and details of its capital from the bud or flower of a variety of lotus, designated by the name of "Nymphea lotus" (56).

The most ancient example known was discovered at Abousir in a mastaba dating from the V dynasty, that of a man named Ptah Schepses. The shaft imitates a bundle of cylindrical stems to the number of six, held at the top by five closed bands; below this collar the grroves between the stems are partly f

filled by small stems apparently kept in place by by the pressure of the bands. Broad and thin with beveled edge, the base evedently represents the ball of earth swelled by the packet of the roots. The capital, whose general outline reproduces that of a closed lotus flower, groups in a bouquet as m many buds as there are of large and small stems in the bundle. The imitation is rather realistic, carefully distinguishing the petals and sepals, and accenting the relief without omitting to incise the longitudinal stries shown by the model. Set on the top of the bouquet and not projecting beyond it is a pretty thick block.(56, 3).

The vogue of the order under the Middle empire is attested by the actural or figured specimens shown by the tombs of Be-
91 ni-Hassan and of El Bershen. The formula is the same, excepting that it comprises more conventionalization in the interpretation of the floral motive, an enormous diminution of the
92 thickness of the abacus and a slight increase in its horizontal dimensions. The proportions are slender, the ratio of t the lower diameter of the shaft to the total height including the base being 1 to 7.(56, 4).

The column with lotus bud appears to have been disdained by the art of the New empire. It received favor again in the P Ptolemaic epoch, but under a form modified by lowering the b band and concealment of the bundle in the mass of a cylinder. A good example of this type is to be seen at the Temple of Isis at Philae.(56, 7).

Of the type of capital in form of the expanded flower, we possess for the Pharaonic period only representations (56, 8, 9). These teach us, that aside from the different capital, it does not differ from the column just described. On the c contrary, the Ptolemaic epoch, notably at Edfou, presents examples showing an excessive multiplication of secondary motives and the enclosure of the bundle within a cylindrical envelope. In all cases the abacus is reduced to the dimensions of the shaft; masked by the projection of the bell, it has no function other than to receive the load of the beam.(56,10).

The Column of Papyrus Form.

Singularly more brilliant was the fortune of the column of

papyrus form, whose most ancient known application is seen in the funerary Temple of Neoserre (V dynasty) at Abousir.(58).

The plant which served as a model is a reed (Cyperus papyrus). The stem, whose section represents a triangle with convex sides, emerges from a sheath of lanceolate leaves and flowers in an umbel of varied profile, according to the phase of its development, from that of an elongated acorn to that of a bell widely opened at top. Like its rival lotus column,
93 the papyrus column comprises two variants, according to whet-
14 her its capital imitates the closed or expanded flower of the plant.

The general formula furnished by the papyrus bud appears closely related to that, which interprets the lotus under the same aspect; for in both are recognized the same divisions, the same essential elements, the same treatment of the modeling, and the same conception of the effect. Yet they are distinguished by differences, some of which are considerable. In a general way, such as appears in the time of the XII dynasty at Bubastis, Haoura, in what remains of the funerary Temple of Amenemhet III, are more in relief and more picturesque.(58, 3). The base loses width and gains height; the shaft presents an outline with movement as a result of a reduction of its lower part, giving it a very pronounced bulbous form, exactly the appearance of a tuft issuing from a single base; an appearance so much more apparent since the bottom of each stem is ornamented by a carved representation of the lanceolate leaves otherwise sheathing the base of the model plant. At the same time, the circumference is accented by the substitution of a pointed section with sharp edge for the semicircular section of the stems of the lotus bundle. From that m modification results an emphasis on the shades, that strengthens the sculptured effect; to which also energetically contributes the darker zone at the reduction of the foot of the shaft.(57).

Yet there was early a marked tendency to obliterate the original appearance of the order, both by a multiplication of the elements of the bundle and by an increasing conventionalization of forms, at the expense of the relief and of truth

in imitation. Thus the specimens furnished by the ruins of
Bubastis and by those of Haoura exhibit a bundle and a bouqu-
et composed of eight units. Likewise for the secondary plan-
ts inserted in the grooves of the shaft and under the collar;
their number is thrice that comprised in the arrangement of
the lotus column, and they are cramped within the band of fi-
ve joined annulets; at the same time their projection dimini-
shes; engraving tends to replace relief; finally, they are
flattened at the same time they are enlarged. This mode per-
sisted under the New empire, as it appears in the colonnades
of the columnar hall and of the peristyler court of the Temp-
le of Luxor and of that at Soleb, both works of Amenophis III.
The proportions remain elegant, the total height containing
the greatest diameter of the shaft a little more than five
times.(57; 58, 6).

95 The smoothing of the forms just noted was precipitated in
the time of the New empire by the necessity found by the arch-
itecture in too numerous productions, too considerable and t
too hasty, for sacrificing the effect of the details to that
of the whole, of substitution for granite and fine limestone
of sandstone, which is less susceptible of sculpture; finally
to furnish the engraver and the scribe the most plain surface
possible. At Tell el Amarna, the new school was not content-
ed with enclosing bundles of 32 stems; they conceived these
as carved in the cylindrical sheath at four or five places a
and covered with a painted or sculptured ornamentation.(56,10).
The transformation of the bundle into a shaft and of the bou-
quet into a calyx, both equally smooth, was consummated at t
the epoch of the XIX dynasty, when to the causes previously
96 mentioned came to be added that creating the increased propo-
rtions of columns; reducing the visibility of the upper parts
and excluding refined sculpture.

From the reign of Seti I, as shown by his funerary Temple
at Kourna, appeared a column with cylindrical shaft and with
a truncated cone as capital, which soon triumphed at Karnak
in the lower aisles of the columnar hall and in the Temple
of Khons, as well as in the Temple of Ramses III at Medinet-
Habou.(58,7). Of the primitive type there remains then but
the general outline; it is still affected by the modificatio-

modifications of the profile of the abacus and of the base; increased height of both, reduction of the surface of the second and a rounding of its bevel.

The proportions tend to become heavy; the columns of Kourna and those of the lower aisles of Karnak only measure a little over four and a half diameters in height, those of Medinet-Habou only four.

Yet the memory of the original forms is practically retained by the engraved representation of a fivefold band at the top of the shaft, by the painted representation of the bands of the little bouquets, complementary to the principal one, and finally by the lanceolate leaves at the bottom of the bulbous shaft.

The archaizing tendencies of the Saitic and Ptolemaic periods appear to have restored to honor the fashion of the bundle shafts and of capitals in form of a bouquet of buds. But the examples to be seen at Achmounein (Hermopolis magna) and Medamout, north of Thebes, betray a shocking misunderstanding of the effect of a column, since the impression of growth is contradicted by the repetition of the enclosing collar at three places with equal intervals.

The type of the capital of the papyrus column, in the image of the expanded umbel of the plant, is often designated by t the term bell-shaped, on account of its resemblance to a bell with its opening upwards. It did not appear, -- at least in the actual state of that known in historic times, -- before the period of the Middle empire, to which belong the specimens discovered at Kahaun and the representations visible in a tomb at El Berscheh.

In any case a single flower sufficed to compose the motive, just as the shaft represents a single stem, although for the reason of appearance was retained the collar of the bands.((58, 8 - 11; 59). The Ptolemaic and Roman epochs conceived a hybrid type, of which characteristic specimens are seen at Philae and Edfou; below the bands, whose place is lower than ordinary, the shaft is cylindrical; above it is conformed to a bundle of slender stems and is crowned by a bouquet with inserted flower stems. The abacus is narrow and is entirely

masked by a corolla. The relative realism of the ornamental conception of this order is manifested by the representation of the sheath of lanceolate scales characteristic of the base of the plant, of sepals beneath the umbel, and finally by the radiation of the needles composing that. Yet it is a fault contrary to the actual appearance in imposing the bulbous sh-ape at the bottom of the shaft indicating a single reed and no longer a bundle, for example to be observed at the Ramess-eum. It is a defect in taste in the vertical development of the abacus of the capital to the proportions of a prism, and the accenting of its appearance by the sculpture on its faces. Philae presents an example of this treatment, contemporary with the decline of the school.(58, 12, 13).

The papyrus column with umbel or bell was in vogue under t the New empire, notably from the XVIII dynasty. It was part-icularly employed to support the central nave of columnar ha-lls, which was higher than the others for practical reasons. Hence its relative slenderness in height, being more than six diameters; its diminution so reduced as to be scarcely percep-tible to the eye.(58, 11; 59; 31).

The Palm Column.

In all periods a third type of column in form of a palm was concurrent with those just presented; it appeared from the t
98 time of the V dynasty in the funerary Chapel of the Pharaoh Ounas; it retained the favor of the Middle and New empires, as proved by the beautiful examples to be seen on the one ha-nd at Bubastis, at Heracleopolis magna, and especially at El Berschen (61, 2), on the other in a Temple of Amenophis III at Soleb (61, 5) and in the Palace of Amenophis IV at Tell el Amarna; finally its vogue during the Ptolemaic and Roman epochs is attested by the ruins of Philae.(61, 7; 60).

Its form repeated the characteristic traits of its model, the date palm. The shaft was cylindrical, which did not pre-vent enclosing it at top by five bands, as if it had been com-posed of a bundle; an anomaly explained, both by analogy and by the desire to accent the necessary separation of the two elements of the column. The late period moved this collar m more or less downward to give place to a representation of t the scales on the trunk of the tree. The capital imitated a

sheaf of palm leaves to the number of eight to ten, at the springing of which in late examples are represented bunches of dates. The bell greatly exceeds the abacus.

The height varies according to the periods; at first relatively slender -- at El Berscheh containing six diameters, it became heavier under the New empire -- at Soleb not exceeding
99 five diameters, to resume its primary slenderness in the Ptolemaic epoch. As for the proportions of the base and abacus, they submitted to a law common to the two orders previously studied; they are narrower and higher as they are later.

The Hathor Column. -- The Composite Column -- Different Types.

In sequence to the three types that we have just surveyed should rank some others more seldom employed, such as the Hathor form and the Composite column, favored by the Ptolemaic and Roman periods.

The Hathor column (82) presents the enlarged and conventionalized image of a sistrum, a musical instrument used by the Egyptian women, and which particularly the queens held in the scenes of prayer and sacrifice; this explains the fact, that this form of support appears only in edifices consecrated to female deities. Like the handle of the sistrum, the shaft w was cylindrical. The capital was formed of a prism twice as high as wide and divided into two stories, two faces of which at first, and later all four, were sculptured; a mask of the goddess Hathor in high relief was generally crowned by a cornice, on which was superposed an image of the body of the instrument under the appearance of a sort of chapel facade flanked by two volutes recalling the vibrating parts of the instrument. Applications of this formula are known dating from the Middle empire, for example at Bubastis in the structures of Ousirtasen III (X99 dynasty); there exist many contemporaries with the XVIII dynasty at Karnak, Deir el Bahari, in the
100 temples erected by Amenophis III at El Kab and at Sedinga near the third cataract; but most are the product of the school in its decline, especially notable in the portico vestibules of the Temples of Hathor at Dendera and at Philae.

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with open umbel, presenting its general outline and reproducing its shaft and base. But it differs in the modeling of i its capital which imitates a basket -- frequently overloaded -- filled with flowers and fruits, and which, subjected to t the criticism of a severe taste, is still picturesque and sometimes very pleasing.(63; 65).

The abacus is often excessively developed in height and frequently receives on each side an image of Hathor or that of a sistrum.(65).

Finally, it is necessary to cite some exceptional forms; o one type is otherwise imperfectly shown by fragments found i in the ruins of the Palace of Tell el Amarna, and is characterized by a shaft in the image of a bundle of many reeds connected by rings; another from the same source imitates a trunk enclosed by a clinging vine; finally a third, to be seen in the walk of Thoutmosis III at Karnak, at first sight appears as an inversion of the papyrus umbel, its shaft being a truncated cone inverted, otherwise being provided with the regular collar and its capital resmebling a bell in its normal position; in truth it realizes the translation into stone of a wooden post, numerous representations of which have been preserved to us in the paintings, without mentioning that one recognized in abridged form in the hieroglyphic sign for the object.(64).

In brief, the sculptures of the varieties of isolated supports just analyzed appear essentially picturesque, conceived to please the eye and interest the mind by the attraction of a naturalism tempered by the imagination and by the interest of ingenious transpositions and skilful conventionalization. Doubtless they are affected by some structural and decorative inconveniences, yet their appearance sufficiently expresses the function of the structure, and their form is quite free and harmonious, so that the general appearance is very happy, assuring to the inventions of Egypt a place of honor in the series of universal art.

VI. Effects of Ornamentation.

As all epochs of its career and more and more as it became older, Egyptian architecture showed a weakness for the adven-

102 adventitious effects produced by the beauty of the materials, by polychromy, and for decoration by ornaments or figures.

Effects of the Materials.

When the means did not permit building with choice materials, recourse was had to the artifice of a facing. From protohistoric times this practice appears in a paneling of slabs on the walls of the sepulchral chambers, and in a coating with white clay or plaster. Later for an important monument, if the resources sufficed, they did not fail to incur the cost of a facing of choice stone, polished perfectly so as to reflect the dazzling light of the Egyptian sky. Thus the great pyramids of Gizeh were entirely covered with the finest Mokattam limestone, excepting the base, that was girdled with granite; so at Dachour the brick pyramids of Ousirtasen III
103 and of Amenemhet III bore a covering of stone; likewise again were lined the great gallery of the Pyramid of Cheops with c choice limestone and the funerary chamber with granite; the interior of the Tomb of Neouserre at Abousir with black basalt, etc.

Commonly and particularly under the New empire was employed the more economical procedure of a coating of stucco carefully smoothed, which further presented the advantage of facilitating the execution of reliefs and engraving, appreciated by a civilization loving luxury and interested in images. For modest brick structures, they were contented with a coating of white mud.

By taste and also because the programme of a temple or tomb necessarily comprised a considerable quantity of images and of inscriptions, Egyptian architecture under the New empire came to decorate all available surfaces, whether belonging to a column or wall, to a ceiling or the pavement, and whether external or internal. Happily the defects resulting from such prodigality were largely reduced by certain peculiarities of expression in relief of Egyptian art, such as a very decided summary presentation of the rendering, a coloring by flat tints, a processional composition, a perspective by superposed figures, all more or less excluding a realistic appearance and producing the effect of tapestry rather than of a painting.

The mode of execution of the ornamentation was most frequently engraving or mural painting (31; 37; 44; 66); quite commonly a sunken outline in the surface around the motive in r relief (67); more rarely sculpture in very low relief.

Effects of color.

Whether external or internal, the decoration essentially c comprised a color effect. Externally this was indispensable for giving body to the edifice, whose forms tended to vanish under the radiation of a blinding light, as we have observed, and whose outline is often badly detached from the background of rocks or of brilliantly illuminated sand. Internally it rendered the service of warming and enlivening the gloom of the porticos and columnar halls, as well as the obscurity of the sanctuaries. Egyptian architecture had the merit of comprehending the equal necessity in both cases for seeking richness of color and high tone; for contrasting the parts and for arranging simple and free harmonies, finally to realize accord of colors with the degree of lighting and with the destination of the place. Skilful in the preparation and application of the materials, versed in the knowledge of the relations of colors, the decorators employing them have created models of monumental illumination.[1]

Note 1. Their palette was particularly charged with blue and then with red; afterwards came yellow, green, black and white.).

Their means varied; painting, applications of metal, incrustations, and enameled facings.

Executed with white of egg or gum, sometimes by a wash, sometimes by applying spots and lights, Egyptian decorative painting is as remarkable for its adhesion to the ground and by the permanence of its pigments, as by the beauty and vigor of its coloring.

Metal was utilized as coverings of copper, overlays of bronze, gilded or plain, or as gilding placed on projections or in hollows.

Polychromy by incrustation on stone, stucco or cement was much appreciated; the filling materials were plaster, bits of stone, or even colored glass pastes. Thus at the ruins of

the Palace of Tell el Amarna were inlaid in white limestone, black obsidian, red quartz and black granite; in yellow quartz, bits of black or red sorts; in red granite, alabaster, in natural stone, blue and red enamels.

Finally, glazed or enameled tiles were employed. One of t the chambers of the stepped Pyramid at Saccara (III dynasty) was faced with rectangular plaques, slightly convex on their visible surfaces, whose ground tint was green or brown with blue, red, yellow or green for the hieroglyphs or inscriptions. The constancy of the use of this precious factor of polychromy in the course of Egyptian history is attested by numerous articles.[1]

Note 1. Yellow and green bricks, stamped with the cartouche of Pepi I (VI dynasty); tiles collected in the part of the Temple of Karnak erected by Amenophis I; various fragments f found in quantity at Tell el Amarna, at the Temple of Ramses III at Medinet-Haoou, and especially in an edifice built by the same prince at Tell el Yahoudieh, north of Cairo, and in the ornamentation of which were substantially employed together ceramic plaques and glass pastes.

Selection and Interpretation of Motives.

Considered with regard to the choice and interpretation of the motives, Egyptian architectural decoration exhibits a taste for geometrical arrangements of conventionalized natural motives. It derived the happiest effects from these, thanks to the charm of the combinations, the freedom of the outlines, the rythm of the arrangement, the richness or the harmony of the polychromy. Its favorite elements were the flowers of the lotus, papyrus and lily, closed or opened, palm leaf, rosettes and scrolls.(63; 69).

The themes borrowed from the plant, animal or human reality reveal both this acceptance of the natural conditions, that we have mentioned several times, a very naturalistic conception of ornamentation; finally in a very great measure of feeling for adaptation to the place and the purpose.

In an interior these were charming, cheerful and diverting, recalling aspects of nature or of the views of ordinary life familiar and sympathetic to the master of the dwelling; on t

the pavement being images of water, ground, plants and fishes; on the bases of the walls were plants, animals and insects; on the upper surfaces of the walls being pleasing scenes of life.(70; 71).

The decoration of the tomb was carefully adapted to the needs as well as the beliefs attributed to its occupant. So l long as the life in the beyond was represented as a "double" of that here, this consisted of faithful representations of the conditions and characteristics of the terrestrial existence of the deceased, of the elements of his future, the signs of his social position, of his deeds and acts, useful or agreeable.

When the more spiritual conception of the migration of souls into another world originated in the time of the New empire, into the nocturnal habitation of the sun, there were represented the deities, genii of Hades, the stages of the solar course, the wanderings and the judgement of the shades.

There was no less fitness in the ornamentation of a temple, for this not only emphasized its purpose as the "house" of a god", but also the profound causes, conditions and circumstances of its erection; the humble and anonymous piety of the entire country, the devotion of a Pharaoh, the sole qualified intermediary between man and the deity, frequently the gratitude of a sovereign heard by Amon. The decoration of the interior tended to impress on it the appearance of a reduction of Egypt. Coated with blue, sprinkled with golden stars, the ceiling was properly a sky; above the middle aisle of a columnar hall appeared a file of vultures, which completed the resemblance and appeared to guard the way of access to the sanctuary (35; 72); in the Ptolemaic epoch, it was further animated by figures of deities and of the genii of the seasons, of the months and the constellations. That the pavement of a h hall was actually a part of the valley of the Nile was clearly announced by the columns in form of the lotus, papyrus and palm, and the images of indigenous plants arranged at the base of walls with the procession on the surfaces, of persons bearing offerings symbolizing the Nile and the provinces; finally in accord with the primitive political division of Egy-

Egypt into the two realms of the North and the South, the rule of contrasting a northern region dominated by the image of the papyrus, the heraldic emblem of lower Egypt, and a southern on which reigned the representation of the lily, the armorial sign of the upper country.(66). The other elements of the decoration were no less significant. On the facades of the monument and on the front of the pylons was the representation of the triumphs of Pharaoh, nowise out of place, since the sovereign thus attributed them to his celestial father; in those public portions of the interior were seen the ritual acts of the prince, expressing his relations with the gods a and the union of the two human and divine natures realized in him; finally in the proper dwelling of the god were only divine images; those of the master of the house, his relatives and his race.

Indeed the ingenuity of invention recommends many productions of Egyptian architectural decoration. Such as in the room containing a stairway in the Temple of Dendera giving access to the terraces, the representation of a procession ascending at one side and descending at the other; such again was the representation on the pavement of the passages trod by t the feet of Pharaoh, of sculptured of painted captives, as m may be seen at the threshold of a ruined edifice of the Ancient empire at Hieraconopolis, or in the central aisle of a hall of the Palace of Amenophis IV at Tell el Amarna.

112 Section II. Architecture in Mesopotamia.

It is expedient to present as a whole and almost on the same plane the architectural works of the three countries, which in the ancient history of the East respectively bear the names of Chaldea, Elam and Assyria, and which consist of:-- the first, of the plains watered by the Euphrates and the Tigris from the point at which these streams approach each other; the second, of the low and even marshy lands at the east of the Chatt el Arab with the stepped terraces as far as the mountains on the border of Iran; the third, of the plateaus rising at the north of Chaldea as far as the foot of the Armenian mountains.

Necessarily over so considerable an extent and in the course of a history, whose revelations are scarcely touched by e excavations, but which permit its duration to be estimated at three thousand years at least, the art of building did not p proceed everywhere and always in the same fashion. But though we know almost nothing of the primitive Elamite production, that we have only a glimpse of the Chaldean, and that the Assyrian is yet far from having yielded us all its secret,[1] a close relationship must have united at the same period the v various architectural styles, and in the course of time the different ages of their development; the schools were adjacent, subject to even the same physical restraints, influenced by similar customs, and many times were approximated by the grouping of the country under the same authority; on the other hand in those regions civilization is so traditional, that today in the vicinity of Khorsabad the masons build in nowise
113 different from their predecessors in the same places twenty-six centuries ago! In truth, in spite of the hundreds of miles and the dozens of centuries separating them, to one and the same artistic family belong the ruins of Warka and Tello, of Niniveh and the second Babylon.

Chapter 1. Requirements. -- Monumental Chronology and Topography.

I. Requirements.

At an early date -- at least from the beginning of the third thousand years before our era, and doubtless much earlier, -- Mesopotamia realized the primary condition of artistic activity, material prosperity.

To the considerable fixed revenues of the sovereigns were frequently added extraordinary resources, the result of the policy of conquest and of forays to which they were accustomed. Invested with absolute power and endowed with a semi-divine quality by the credulity of their subjects, they spared nothing to ensure to their sublime dignity the appropriate setting of magnificent residences, not slight and perishable like those of the Pharaohs, but solid and strong, each one p placing his self-love on possessing one or several, which should form the measure of his glory and should eclipse those of his predecessors. In truth, it was to house and protect them, which especially occupied the architecture of Mesopotamia.

On the contrary, the private demand always remained secondary. As still today in the same places, the rural habitation was nothing more than a miserable cabin, when it was not reduced to a hut of reeds, and if the city dwelling comprised a certain comfort and no luxury, it was never monumental.

In absolute contrast to that of Egypt, the civilization of Mesopotamia never created a funerary architecture at all. C Commonly the corpses were interred in the earth beneath the houses, or they were placed in coffins of terra cotta. Rare-
114 ly were they deposited in small brick vaults, of which Elam and lower Chaldea present examples; more frequently were constructed common cemeteries -- such as those of Warka, Mougeir and Sourghoul in lower Chaldea, by heaping on a platform terra cotta coffins connected together by a layer of earth and bricks.

The religious requirement in Mesopotamia lacked greatly in comparison with what we have noted in Egypt. Doubtless the deities there were numerous and were revered, and the kings

voluntarily proclaimed themselves as their submissive vassals, their "agents in charge", and never failed to mark their devotion by the erection of new sanctuaries and the restoration or embellishment of ancient ones. Yet if it be compared with its rival on the banks of the Nile, the architecture of Mesopotamia appears to have received neither such frequent appeals, nor in particular programmes so ample and so capable of inspiration.

II. Monumental Topography and Chronology.

In its present state, the history of the architecture of Mesopotamia can be distinguished in a primitive epoch corresponding to the third thousang years B. C. The evidence is:-- in upper Chaldea, the remains of the great Temple of Bel at Nippur, in part contemporaneous with the 25 th century B. C. and partly earlier, and those of the Sanctuary of Sippara at the place now called Abou Habba near Bagdad, which date from the end of the third thousand years; in lower Chaldea, at Mougheir -- anciently Ourou -- and at Warka -- formerly Ourouk, -- at Abou Sharein -- site of ancient Eridou, are remains of temples, and at Tello -- called Lagash -- are important ruins, which even take us back to the 28 th century, the most notable being those of the Palace of Goudea, prince of the locality about 2340 B. C.

The first destruction of Babylon by the Assyrians in 689 d destroyed the structures of the sovereigns, who from the time of Hammurabi (about 1950) had erected there many great palaces and many temples, "whose tops reached the sky", and we find any monuments only by coming down to the last third of the 12 th century B.C. and by passing into Assyria. They are presented to us in the city of Assour, which from the beginning of the second thousand years was the capital of a powerful k kingdom, and always remained the holy city of the empire, by the great Temple of the supreme god Assour, and by those of Anou and of Adad, creations of Tiglathphalasar I.

The best know phase of the architectural production of Mesopotamia extends from the beginning of the 9 th to the end of the 7 th century B.C. The elements are substantially furnished by the little remaining on the left bank of the Tigris op-

opposite Mossoul, of what was Nineveh before it was sacked by the Medes in 608. What has been discovered are the creations of a line of sovereigns, who are counted among the most powerful, the most magnificent, and the greatest builders in history, and are distributed between the three places; Khorsabad on the north, Koijoundjik in the middle, and finally toward the south in Nimroud -- now Kalakh -- at the junction of the Tigris and the Zab, where may be distinguished three palaces, respectively sitaated at the southwest, north and northwest.
116 The last commences the series, having been built by Assournazirpal, who reigned from 885 to 860. The hill of Khorsabad preserves the vestiges of the City and Palace of Dour Sharroukin, the work of Sargon, king from 772 to 705. Then comes at Koijundjik the residence of Sennacherib (705-681), that he erected with the enthusiasm and which seemed to him so beautiful, that he named it "the Peerless"; from the same reign d dates the erection of a "Palace for Festivals" consecrated to the god of Assour in his city. Then at Nimroud are the Southwest Palace and that of the North, the first devised for Asarhaddon (681-668), the second for Assourbanipal.(668-625).

The restoration of Babylon in 680 opened on the banks of t the Euphrates a great building locality, whose activity lasted until the destruction of the city in 519 by Darius, building its fill from 625 to 605 under the reigns of Nabopolassar (died 605), and particularly from 605 to 562 under Naboukodonosor, one of the best characterized among the princes impassioned with splendor and with building. The importance of t the effort is attested by the enormous size of the four hills of ruins named Babil, El Kasr, Tells Amrau and Djoum-Djouma, which at the noth of Hillah and on the left bank of the river, mark the site of the great city, and by those of the mound on the right bank, which contains the ruins of Borsippa, a satellite of the capital. The city was immense, its area exceeding 190 square miles; its ramparts were formidable; numerous
117 were the temples -- forty-three if the texts are credited -- four of which have recently been discovered; in the first rank that of Esagila, the house of Mardoux, the supreme god, e erected by Asarhaddon, enlarged and beautified by his succes-

successors; then those of Ninmagh and of Ishtar, and at Borsippa that of Nebo, vassal of Mardouk; grand were the avenues; gigantic were the royal palaces, notably the three built by Naboukodonosor, one of them covering about 11 acres of the place called El Kasr, another furnishing the materials for t the hill of Babil, doubtless the same, whose lofty terraces were celebrated under the name of the "hanging gardens of Babylon".

Chapter 2. Natural, Human and Technical Conditions. Radiation of the Art of Mesopotamia.

I. Natural Conditions.

By reason of the physical conditions of its production, the architecture of Mesopotamia found itself opposed by several difficulties, some of which were quite serious.

A primary one resulted from the instability of the soil of the plains, saturated by water filtering in from the rivers and periodically covered by the floods of the Euphrates and the Tigris.

The climate required a rational adaptation of the plan and the construction to various and in part contrary peculiarities. As extremes it opposed dry and torrid summers to wet winters, windy and sometimes cold. From May and often from the middle of April until November uninterruptedly prevailed temperatures, which in the shade maintained an average of about 104° Fah., while the excess reached 122° Fah. Restricted to the winter season, the rains fell in heavy showers, that became deluges at the approach of summer.

With regard to materials, the architecture of Mesopotamia was not exactly spoiled by nature. Chaldea and lower Elam are entirely without stone; on the other hand the deposits of
118 the rivers supply all Mesopotamia with a mud entirely suited for construction in clay.[1]

Note 1. The material of the bricks of Khorsabad, as reported by Place, is "compact, pliable and unctuous; its property of adhesion is very remarkable, and it is so plastic, that it cannot be better compared, than to potter's or rather to modeling clay."

Assyria possesses banks, which can be quarried under the open sky, of common limestone and of a sort of Gypsum alabaster of gray color with whitish spots, soft, easily polished a and carved, but resisting dampness but little. Bitumen springs everywhere and great reeds abound in the lowlands; as for wood, except on the highest parts of Elam and of Assyria, there is nothing more than the mediocre material of the palm.

Indeed the architecture of Mesopotamia could supply itself with materials from adjacent countries, lacking in its own; ordinary limestone, marble and hard stones in upper Syria;

diorite at Mt. Sinai and in Arabia; fir, cypress and cedar on the heights of Lebanon and of Amanus. So much better, as transportation was facilitated both by the existence of an extensive network of navigable streams, natural and artificial, and by human conditions found in those countries by the art of building.

119 II. Human and Technical Conditions.

These indeed compensated for the insufficient favors of nature.

The political administration of their peoples, the power a and wealth of their kings, placed almost unlimited resources and means of action at the disposal of the architects of Mesopotamia; multitudes of submissive laborers, national levies or prisoners of war, as well as enormous quantities of rare materials, the booty of campaigns, tributes of vassals and gifts of allies.

Construction in Mesopotamia must equally benefit by the taste and aptitude of the race for mathematical speculations, by the methodical bent of its genius, and by its industrial skill; it was early provided with metal tools,[1] with assured formulas and perfected processes, with an accurate and convenient system of measures, as well as the art of drawing plans at a scale.[2] Finally the masters of the works in Mesopotamia knew how to discipline labor, to organize the production and management of materials equally prodigious, and to coordinate the efforts of numerous gangs, among which the magnitude of the undertakings and the haste of the sovereigns forced them to distribute the demands.

Note 1. Elam and Babylonia excelled very early in the casting of bronze, and the excavations of Khorsabad have revealed, that in the 8 th century the use of iron was common.

Note 2. A seated statue from Gudea (about 2340) holds on its knees a tablet, on which is traced a plan of a fortified palace, and on it is placed a scale divided into 16 parts.

III. Radiation of the Art of Mesopotamia.

The influence of the art of Mesopotamia was immense and it survived the civilization, of which it had been a significant expression.

At first the political and economic expression of the vari-
ous Chaldean and Assyrian empires, as well as the active exp-
ort of the products of their industry by the Phoenicians,det-
ermined a wide diffusion of certain of its processes and of
many of its decorative formulas in all western Asia, and in
120 the eastern basin of the Mediterranean. Egypt was itself af-
fected after its Syrian campaigns had reduced its distance f
from the country of the Tigris and the Euphrates.

Later the architecture of Mesopotamia furnished in large measure the elements, that constituted in the same or adjoining countries, those of the Persia of the Achemenides, of Parthia, of Persia of the Sassanides, and of Mohammedan Mesopotamia.

Finally, it influenced Chinese architecture, impressed the Roman school and exerted a strong effect on the development of Byzantine art.

At first the political and economic expression of the various Chaldean and Assyrian empires, as well as the active export of the products of their industry by the Phoenicians, determined a wide diffusion of certain of its processes and of many of its decorative formulas in all western Asia, and in
120 the eastern basin of the Mediterranean. Egypt was itself affected after its Syrian campaigns had reduced its distance f from the country of the Tigris and the Euphrates.

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Chapter 3. The Programmes and their Realization.

I. Civil and Military Programmes.

The City.

The civilization of Mesopotamia -- at least such as it appears to us in the course of the first thousand years B.C. -- comprised an already important part for civic architecture. The streets of Assour were recently cleared and were narrow and crooked, but were provided with sewers; those of Dour Sharroukin (Khorsabad) were fine streets 40 ft. wide; according to Herodotus, those of Babylon formed a systematic network by the intersection of twenty-five avenues perpendicular to the Euphrates and of twenty-five parallel to the river, s spanned by a bridge; further a sacred and richly ornamented avenue traversed the city leading to the Temple of Mardouk.

The Fortifications.

Such as are described to us by the texts relating to Babylon, and are shown by the plan engraved on the tablet held by the statue of the architect of Gudea (24 th century), and by the remains of the wall of Dour Sharroukin (end of 8 th century), fortifications in Mesopotamia manifest a remarkable skill in defense.(76; 78). It is not limited to the elements of a passive resistance; height, thickness and repetition of
121 battlemented walls -- those of Dour Sharroukin rise to 75.5 ft. and measure 78.7 ft. from one face to the other. They f further knew how to organize an active resistance by ensuring the flanking of the ramparts by towers and by retarding passage through the gates by the construction of a series of corridors and of courts, which at the entrances to Dour Sharroukin have a length not less than 220 ft.[1] Indeed these gates in time of peace took the part always attributed to them by the East, that of places for gathering, sheltered against excess of heat by the thickness of their walls and vaults, and by the current of air in their course; those of Dour Sharroukin afford a useful area of 10,764 sq. ft.(78,2; 79).

Note 1. Those of Dour Sharroukin are rectangular, have a front of 44.3 ft., a projection of 13.1 ft., and succeed each other at intervals of 88.6 ft.

122 The House.

In conformity to the oriental custom, a dwelling in Mesopo-

Mesopotamia opposed a blind wall to the exterior; a narrow c corridor gave access to a court more or less large and paved with pebbles, bricks or slabs, on which opened a principal r room for the common life and receptions, sleeping chambers and storerooms; stairs led to terraces, the nocturnal habitation during the hot season. It appears indeed -- Herodotus affirms it for Babylon -- that certain elevations comprised one or even several stories.

The Palace.

The form and general arrangement of the palace in Mesopotamia was adapted to the position of the master, the customs a and the country (77; 78).

And first, like the temples, they dominated above the community the human dwellings, being always perched on an artificial terrace, which rose to some 32.8 or 49.2 ft.[1] and might extend to 98.4 ft., like that in Babylon supporting the Palace of Naboukodonosor discovered beneath the hill of Babil. Access to these heights was arranged by ramps and by stairs built agains the supporting walls. Without speaking of the advantages found therein by the builder,[2] this mode recommended itself by the fact, that the prominence of the royad dwelling manifested the sublimity of the sovereign, at the same time that it strongly contributed to its security.

Note 1. The height is 32.8 ft. at the southern Palace of Naboukodonosor at Babylon, 39.4 ft. for that of Gudea at Tello, and 45.9 ft. for that of Sargon at Khorsabad.

Note 2. See page 133.

In the number of essential characteristics of the palace in Mesopotamia again figure the grandeur of its dimensions, the result of the necessity for ensuring in buildings without upper stories, besides the private dwelling of the master, a g governmental administration, a body guard, a numerous household, and also storage for a mass of articles, various provisions and the produce of imposts and tributes paid in kind. Already the terrace bearing the Palace of Tello measured 656 ft. on a side and the structures covered 17,686 sq. ft.; nearly 27.4 acres were occupied by the two hundred and nine new halls and the thirty courts of the residence of Sargon at Khorsabad. I

123 The arrangement realized in very satisfactory fashion distinction and isolation -- required in all times by the customs of the East -- of the private residence (harem), the apartments for reception (serail) with their grand hall (selamlik), and the common rooms (khan). It succeeded in this by assigning to each of these divisions a separate and distinct quart-
124 er, the various service rooms being arranged around a court, that possessed its special entrance and only communicated with the adjacent parts by narrow and crooked passages, easily barricaded; in particular the access to the private portions of the residence was carefully prevented.

Whether it related to the whole or one of the elements -- the hall, court etc., the outline was always that of a parallelogram, square or rectangular; likewise the orientation of the edifice by its angles was constant, and by this no facade was entirely north.

The proportions of the courts varied according to the importance of the services, whose rooms opened on them; at Tello the largest occupied 3843 sq. ft., and at Khorsabad the principal one covered not less than 2.47 acres. On the contrary, the halls were relatively small, and for structural reasons, (page 136), they were only extended in length; at Tello the
125 greatest width is but 12.0 ft. for a length of 39.4 ft.; at Nimroud this increases to 23.0 ft. and attains 32.8 ft. at Khorsabad.

With their towers, vaulted passages, courts and internal chambers, the gates of the palaces in Mesopotamia form actual castles, which served not only for fortifications, but also for external waiting halls.(76,2).

As the residence of a sovereign, who was priest as well as
126 soldier, a palace in Mesopotamia was always furnished with an oratory composed of a tower in stories and a chapel.(P. 127).

Texts, of which the most ancient is signed by Tiglathphalazar II (743-727), teach us that an Assyrian palace counted a among the number of its essential elements an edifice "after the fashion of the country of the Hittites, which their language termed a hilani",[2] named hekal in Assyria. This -- we s shall return to it in speaking of architecture among the Hittites (P. 152) -- was a state residence comprising a spacious

vestibule on columns, a throne hall and a chamber for repose. (77, 2, 4; 78).

Note 2. Inscription of Sargon. See similar ones of Tiglathphalazar, Sennecherib and Assourbanipal.

The summer residences of the kings and of the great men possed the pleasure of gardens, laboriously maintained by means of irrigation, enlivened and refreshed by canals and basins; those were celbrated, which were ordered by Sennacherib at K Koijunkjik and by Naboukodonosor at Babylon. Their views were enjoyed from the shelter of kiosks, chiefly open and which we know by their representations on the reliefs of Koijoundjik and of Khorsabad.

Palace or house, the habitation in Mesopotamia was provided with certain comforts.

The protection against heat consisted of the extreme thickness of the walls and of the covering; in the arrangement around the courts of the harem of a sort of deep niches with e elevated floors, which hangings and portieres sheltered from light and rain, and that formed small fresh and ventilated rooms; finally by a wise restriction of the openings. Lighting and ventilation were substantially ensured by the doorways, which indeed were of great dimensions,[1] and additionally by pottery tubes passing obliquely through the covering.

Note 1. At Khorsabad, the width of the doorways varies between 6.6 and 9.8 ft.

As suitable in a country exposed to deluging rain and torrid heat, great precautions were taken for the removal of water and sewage.

All the houses uncovered at Assour were furnished with a s sewer; the Palace of Khorsabad possessed a complete system of drainage discharging into great collecting sewers.[2] (80). Finally a bath hall was an essential part of every arrangement.

Note 2. At the centres of most halls, a hole about 4.7 ins. in diameter is pierced in a square slab and forms the opening to a descending duct 11 ins. in diameter; at first vertical and then inclined, ending in a sewer 3.3 ft. wide and 4.6 ft. high.

II. Religious Programmes.

A temple in Mesopotamia comprised two very distinct parts;

a symbolical monument and a divine dwelling.

Chaldean chronology conceived the earth as a mountain, vertically divisible into seven zones, the upper one being the dwelling of the gods, and horizontally into four cantons arranged according to the cardinal points. This belied was embodied in a Ziggourat (ziggomatou), a tower in several stories, to which was applied the significant names of "house of the terrestrial mountain", "mountain erected toward the sky like the great mountain".

The plan of a ziggourat always formed a parallelogram orientated by its angles; but its elevation comprised two types, one peculiar to southern Chaldea, and the other to Babylonia and Assyria. The first, an idea of which is permitted by the ruins of Ourou, Eridou and Ourak, superposed three cubical m masses, unequal in area and height, the two upper ones receding toward the rear of the monument, the last one being crowned by a chapel, and all being accessible by stairways.[1].(81, 1). The second form was detailed by Herodotus according to the example offered to him by the Ziggourat of Esagila, the great Temple of Mardouk at Babylon, denominated Etmauki. "It is", he writes, "a regular square measuring two stadia on each side (1214 ft.). At the centre is seen a massive tower, a stadium in length and width (607 ft.); on this tower rises a another, and on this second is yet another, and so forth, so that one counts as many as eight, including the terrace. The ascent is made externally by means of a ramp winding around all the stories. In the upper tower is a great sanctuary, in this large sanctuary being a richly furnished bed, near which is a golden table; no statue is to be seen there". Strabo adds that the height of the monument equalled the length of its b base (607 ft.). The excavations at Khorsabad have confirmed the statements of the Greek traveler by uncovering a ziggourat placed on a square of 141.4 ft. side, each story of which is 20 ft. high, and is accessible by a ramp with steps 6.6 ft. long.[1] (81, 2; 78).

Note 3. At Ourou the lower story was about 19.7 ft., the upper being 26.3 ft. and the intermediate one 32.8 ft.

Note 1. At Nippur, the excavations revealed a tower still 98.4 ft. high.

As for the house of the god, the plan is known by a description of Herodotus and by the results of exeavations of Nippur, Babylon and Assour; it was generally simple but otherwise con-
129 ceived in the image of a human habitation. It comprised a p primary court, surrounded by the dwellings of the priests and storerooms; an interior court on which opened the treasuries and the chapels; finally the sanctuary which formed a hall f furnished with a bed, a table and a niche, the place of the statue of the deity. The palace of a supreme god -- such was that of Mardouk at Babylon,-- comprised in addition to the p parts just named, on the one hand a "chamber of destiny" (parakschimale), where on the first of each year the deity determined the future; on the other being a "house of sacrifice", (bitnike) or of the "feast of the new year", and a certain number of chapels, which we might call the chambers of friends, in which the master entertained and lodged the vassal deities, who came to render homage to him at the beginning of the year; further, one or several altars in the open air; finally a sacred way of access between richly decorated walls.

The rare examples of commemmorative or votive monuments known belong to the category of steles and embody two different types; on the one hand -- we owe an example to Salmanazar II -- a sort of stepped obelisk, or rather a pile of truncated pyramids with decreasing areas and heights; on the other being a fluted slab, that terminates in a palm leaf, a specimen of which was found at Khorsabad (82). A slab set on a p plinth, that is placed on a substructure, sometimes cut in steps, forms the elements of an altar; the plan sometimes is a triangle and sometimes a rectangle.

130 Chapter 4. The Construction.

In the entire extent of its area and in all the periods of its history, construction in Mesopotamia appears conscientious and skilful, as attentive to the correctness of the work as to the quality of the materials.

I. The Materials.

These are reduced almost entirely to clay, not only in Chaldea, where there is no choice of materials, but also in Assyria, where however stone in abundance was at command and artisans skilled in cutting it, as we shall verify later. This preference is explained by the facilities offered by construction in earth to architects frequently charged with colossal works and compelled to rapid execution; further being forced to employ unskilled workmen in very large measure.

Clay was only used after being well worked and mixed with chopped straw. It was employed either in this state for the massing of walls or forming vaults, or was made into burned or crude bricks, which was customary for all careful construction. These were of several sorts, varying in form and manufacture. As in the case of the most ancient,[1] some are characterized by simple shaping into rectangular form with modest dimensions (length of some being 7.9 ins. , half as wide and one fourth as thick), finally with unsymmetrical faces, one being plane and the other convex, with cavities and grooves made by pressure with the fingers.(84, 1). More frequently they are cakes moulded into square forms.

Note 1. For example, those furnished by the deep layers of the ruins of Nippur or the structures of Our Nina at Tello.

Most of these tiles were employed in the crude form, either after drying -- which was the Chaldean custom -- or still wet,
131 which was the manner in Assyria. Primarily about 7.9 ins. l long, later from 11.8 to 19.7 ins.;and 2.2 to 4.3 ins. thick, they are characterized by an extreme compactness.

Burned bricks were very greatly used in the architecture of Mesopotamia in all times, and particularly in Chaldea, in spite of the scarcity of fuel, were of rare quality. "The texture of those found at the Palace of Sargon at Khorsabad is h homogeneous with an unequaled fineness of grain; made like s stone by burning, they ring under the hammer like a bell; th-

resist tests, that no stones of the same dimensions could support with impunity. "in fact, these are Assyrian tiles, which for a surface of nearly 2.6 sq. ft. measure no more than 2.0 ins. thick!"[2]

Note 1. See Place, Vol. 1, page 226.

Note 2. In Chaldea the current form was a tile measuring 11.8 to 12.6 ins. on a side for a thickness of about 3.3 ins.

Let us add, that brickmakers in Mesopotamia understood how to make their products in various forms appropriate for the required purpose; that of a triangular prism for angle bricks, of a disk, sector or segment of a circle for the elements of a built column.(84, 3); that of a trapezoid for voussoirs of vaults etc.(86, 3; see page 135).

Even in Assyria, the architecture of Mesopotamia never emp-
132 loyed stone except under the empire for necessity or for ornamentation. In Chaldea were fashioned in diorite the sockets for the pivots of doors, and of the same material were made the thresholds. In Assyria limestone was used for substructures; alabaster and sometimes basalt for facings, but economy caused it to be limited for the first to spalls between two facings of slabs set on edge, and for the second to thin facings.

Yet the Mesopotamians knew at all times how to cut stone; even the Assyrians made proof of remarkable skill, cutting in limestone blocks measuring 176.5 to 353.0 cu. ft. and very carefully dressed;[1] quarrying alabaster also in blocks weighing 4.4 tons and in slabs with areas of 80.7 sq. ft. (length 9.8 ft. and height 8.2 ft.) measuring no more than 7.9 ins. thick!

Note 1. Those forming the retaining wall of the terrace of the Palace at Khorsabad measure in some cases 9.8 ft. long, 3.3 ft. wide and 6.6 ft. high; others are respectively 8.9, 6.6 and 6.6 ft., weighing 1.43 to 2.65 tons.

As for wood, the Chaldean builder found himself reduced to the miserable material of the palm tree; the Assyrian could in a more restricted degree utilize the oaks of the adjacent mountains. But both, when laboring for a sovereign, had at command the most valuable kinds; cedar and cypress were impo-

imported in considerable quantities, though with great difficulty.

II. Procedures.

The Wall.

To remedy the fragility of construction in crude bricks in countries were exposed by terrestrial and atmospheric humidity to settlements, slips, even to destruction of its surface, and by heat and wind to injury by drying to powder and being blown away, the architecture of Mesopotamia invented various artifices, all simple and some ingenious, several with more important results.

Let us first note a method of building, that the walls normally have thicknesses of 9.8 to 16.4 ft., that those of 26.3
133 to 39.4 ft. were frequent, and that the cross section of a c city wall might even measure 82.0 ft.! Enormous likewise, the terraces supporting the palaces and temples, at the same time isolated them from the dampness of the ground, having a firm and stable surface.

No less habitual was the protection of the masonry of crude bricks, either by means of a coating of earth, plaster, or a mortar of earth and plaster remarkable for its density and i adhesion, or by a facing made in Chaldea of glazed bricks, or in Assyria composed of enameled tiles or of a stone facing; at need, the builder at Nineveh confined himself -- like the constructor of the enclosure at Khorsabad -- to equip the base of a wall on the same principle by placing it on a stone plinth. To these precautions were added for the mass of the terrace that of systematic drainage, which we have already n had occasion to mention.

Yet the architecture of Mesopotamia gave too much care to
134 the masonry, for us to presume otherwise, than that on it depended in the greatest measure the solidity of a structure. Indeed, whether of bricks or stones, ancient or recent, it a always appears regular and coherent; the beds are always leveled and joints are broken.(84, 2, 5).

The methods of construction in crude bricks were not the same in Assyria and in Chaldea. In the first of these countries the adherence of the courses was obtained by employing

the bricks in a soft state, so that when a wall was finished, it was not a pile but a solid mass. In the second, only dried bricks were used, which were joined by the aid of an adhesive material; this was sometimes clay -- there are examples of such at Tello and at Babylon; sometimes -- the case is common at Babylon and at Nineveh -- a lime mortar; sometimes -- as at the ruins of Mougheir -- a mixture of ashes and lime; the use of which has continued in the same places until our days; sometimes -- as observed at Babylon -- with bitumen.

As for burned bricks, they were either joined with mortar or with bitumen. Note that primitive Chaldea -- as proved by the walls of wells or of canals at Nippur and at Tello -- sometimes set them in "herringbone bond".(84, 1).

In Assyria the erection of a stone wall comprised neither jointing with mortar nor connection by cramps. Where it was composed of a filling of stones between facings, the stability of the two kinds of elements was ensured by seeing that a alternate blocks were extended into the nucleus.(84, 5).

From the most ancient times, construction in Mesopotamia knew and commonly applied the methods of strengthening a wall, comprising the insertion of ties and flanking the wall by buttresses. In Chaldea a brick wall comprised at larger or smaller intervals a bed of reeds daubed in bitumen; sometimes timber anchors were embedded in the mass. As for buttresses, which appeared at the ruins of Warka or of Tello as well as in those of Khorsabad, the importance of the part assigned to them is manifested by their number and by the care with which they were arranged; in Chaldea they were joined with bitumen; those of Khorsabad were massive counterforts, 13.1 to 29.5 ft. wide and projecting 4.9 to 8.2 ft.(81, 1).

35 With these different precautions are contrasted negligences, verified at Khorsabad, of building the walls on the pavement of the terrace without any substructure; a relative negligence, assuming the almost absolute incompressibility of the mass of clay beneath them.

The Isolated Support.

It does not appear, that the architecture of Mesopotamia made great use of the isolated support. Indeed in its Chald-

Chaldean domain this was prevented by the lack of stone and
of wood. Yet there are a small number of specimens of colum-
ns originally from lower Chaldea, Babylon and Nineveh, witho-
ut mentioning those figuring in the representations of Assyr-
ian kiosks already taken into account;(77, 5); the excavatio-
ns of Nimroud and of Khorsabad have exhumed actual examples,
but their purpose does not appear certain.(89). Discoveries
recently made at Babylon have confirmed the statements of St-
rabo in regard to posts made of the trunk of a palm tree hoo-
ped by bands of willow, by revealing a shaft composed of one
of these trees enclosed in a covering of bricks set in bitumen.
Finally, the remains of the Palace of Gudea at Tello show pi-
ers about 5.9 ft. thick and built on rectangular bases, form-
136 ing a group of four cylindrical columns. Each one of these
superposes courses of burned bricks in the form of disks, se-
tors and segments of a circle, very skilfully set with bitum-
en in a manner to ensure a constant alternation of joints.
(84, 3; 85).

The Ground and its Covering.

The floors of the interiors were greatly neglected, which
is explained by the inveterate love of the East for rugs and
mats; they were sometimes paved with alabaster, and as frequ-
ently covered with burned clay tiles; but most of the time,
they were nothing more than an area of tamped earth. On the
contrary, surfaces beneath the open sky were the object of c
care required by the necessity of protecting the mass of the
terrace from all penetration of water. They received a pave-
ment perfectly jointed, generally of large burned bricks, so-
metimes of stones of large dimensions, covering as much as
10.8 sq. ft. and measuring up to 2.6 ft. thick. At Khorsabad
are superposed two layers of tiles, separated by a layer of
sand, the lower one being set in a bed of bitumen.

The architecture of Mesopotamia practised at the same time
covering by ceilings and by vaults.

The first -- mentioned by Strabo and still employed in our
days in the same regions -- consisted in a floor made of the
joined trunks of palm trees, or when it belonged to a palace
or a temple, of beams of cedar or of cypress.(86, 1; 87, 3).

As for the second, which on the evidence of Strabo was common at Babylon "because of the lack of wood", it was composed, either of hemispherical or elliptical vaults pierced by an o opening at the top -- whose image has been preserved by the Assyrian reliefs (86, 2) -- or by tunnel vaults, in executing which the constructors in Mesopotamia were passed masters.

The exploration of Chaldea has revealed, that from the second half of the third thousand years before the Christian era, there was known and commonly applied there not only the method of corbelling -- as proved by the tombs of Mougeir (Ourou) (86, 4), but also that of the radiating beds, -- as proved by the galleries of the Temple of Nippur of of the Palace of Goudea at Tello (86, 5). The latter are tunnel vaults of irregular elliptical section, about 3.3 ft. high and 20 ft. wide. The ruins of Khorsabad proclaim the consummate skill of the Assyrians in the construction of vaults; they built them indifferently with semicircular, segmental or elliptical curves; passing in the same gallery from one form of arch to another and sporting with the difficulties of connecting them; they joined them equally by the method of arches turned without c centres (86, 3), and by that of radiating courses built on s supporting centres.)86, 6; 79).

Finally, they understood how to covyr wide spans; the tunnel vaults of the gates of Khorsabad, with crowns 21.2 ft. above the ground, had spans of 14.1 ft. with a rise of 7.9 ft.; they continued the jambs and their semicircular curves were very regular; in the ruins of the Palace, Place discovered "even the coverings of their stucco - - - considerable pieces of vaults fallen in mass - - sometimes measuring several yards in length, 3.3 or 6.6 ft. span and more than 3.3 ft. thick at the crown".

The materials were dried bricks of appropriate form joined with tempered clay; the method was that of countries poor in wood, being in inclined courses; in case of a wide span, the arch was strengthened by superposing three rings.

The roof was terraced; a layer of trodden clay with a thickness of more than 3.3 ft. protected the interiors as well from rain as from heat.(87, 3). Formerly, as today in the same

regions, by choice above it was placed a platform supported by small pillars and columns, which was likewise covered with earth; this provided an agreeable lodging and a circulation of air, that prevented the heating of the covering.(86,1;79).

To the ordinary massiveness of their buildings, the Mesopotamians contrasted the lightness of the little structures for use as kiosks, whose image is preserved to us by the sculptured monuments.(77, 5). In stone, they were made of a ceiling set on entablatures widely corbelled and supported by columns placed on a substructure; in wood, they consisted of a framework on slender little columns, which served as a frame for a canopy of leather or cloth.

In brief, the architecture of Mesopotamia had the merit of producing a very satisfying result from an ungrateful material, and to it belongs the honor of having introduced for the benefit of humanity the most monumental of all modes of covering, the only one adapted to large spans, that of the vault.

139. Chapter 5. The Effect.

All kinds of effects at the command of the art of building were known and utilized by the architecture of Mesopotamia. But like all its oriental sisters, it preferred those of the order of the senses and gave a wide field to the decoration. It is true that its abilities in large measure were limited by the nature of its materials.

I. Effects of Picturesque or Affecting Order.

That it may have had a feeling for the grandiose is attested by many general or special characteristics in arrangement.

In the entirety, its edifices possessed in a very high degree a character of force and majesty; they owed it to their enormous proportions, to the height of their terrace, the lengths of their facades, the amplitude of their ramps and of their stairways; to the simplicity of their form by straight lines and rectangles, and to their arrangement by repetition of a small number of elements; to the monotony of their appearance, and to the horizontal lines in their elevations.

There was added in greater or lesser measure an expression of a mystical order, to which must have been sensible, races interested in astronomy and astrology; it results from the systematic orientation of the plan by the angles; from numerical combinations like that which equalized the height of a ziggarat and the side of its base; from the quite frequent s subordenation of the arrangement to exhibit the number seven.[1] Thus were numbered by seven the stories of every ziggarat, t the rounds, pilasters, engaged columns, and the decoration of many mural surfaces.[2]

Note 1. Consecrated by the fact, that it is that of the " "lights of the earth", the sun, moon and five planets; that of the days of the week, etc.

Note 2. Compare at Warka seven panels with seven recesses in each; at Khorsabad on the wall of the harem are seven rounds.(87, 1; 88).

140 II. Effects of Harmonic Order.

The Mesopotamians were too well versed in mathematical speculations, for their architecture to not accord with the effects caused by this understanding. The ruins of their monuments presents the verification of their existence. Yet witho-

without speaking of the rhythm that must necessarily result from the fact, that all the bricks being of the same size, a all dimensions were commensurable; it is remarkable, for example, that all the merlons of the cornice of a wall may be inscribed within the same isosceles triangle, which being reversed is in its turn the exact form of the battlements; and also that the fronts of the towers of the wall enclosing Khorsabad are precisely one half those of the curtain walls flanked by them.(44.3 to 88.6 ft.).

Note however, that if the regularity of a geometrical figure characterizes the arrangement of the plan of a Mesopotamian edifice, symmetry is absent from it. The distribution of a building does not balance the elements, and it neglects the uniting virtue of an organic axis; likewise a series of engaged pilasters or columns does not necessarily mean equality of intervals.

III. Effects of the Order of Relief.

Although it must have been influenced by the oriental custom of arranging an elevation with regard to the interior and of reducing to a minimum the external openings, and that an exclusive practice of construction in earth limited its powers, the architecture of Mesopotamia showed itself interested in the effects of monumental relief, more than its Egyptian rival.

And first it recognized the necessity of accenting the skyline of its edifices, lost in the vastness of immense plains and a dazzling sky. It provided this by giving them a crowning suited to impress the eyes; generally this was a crenelated parapet, clearly outlined by the breaks of a sawtooth re-
141 sting on or supported by corbels, and frankly detached from the wall by the band of shadow underlining its projection; (87, 2); sometimes, as indicated by the architectural representations given by the reliefs of Koijunkjik, the series of merlons surmounts an enormous cornice, accented by several projections; or again -- shown by the supporting walls of the
14[illegible] throne hall at Khorsabad -- there was a cornice with towers, cavetto and band in the Egyptian fashion, doubtless imported from the banks of the Nile.(87, 4).

Assyrians and Chaldeans equally favored in all periods of

their history the movement -- in truth very moderate -- imparted to a wall, either by the hollows of vertical grooves or by the relief of the pilasters of rectangular section or of half columns, these moreover being only the decorative transposition of a structural form, that of the palm trunks, which in all times in that country served as the framework for cabins of tamped clay.(87, 3). They were often satisfaied with the realization of one or the other of these two kinds of projections at a scale more or less large; at the ziggarat of Mougeir (Ourou) a facade of 197 ft. is enhanced by nine projections of oblong plan and about 1.6 ft. thick; at the ruins of Warka (Ourouk), there are seven groups of seven half columns, whose diameter measures 1.6 ft. Sometimes the two forms are combined and more or less diversified compositions are sketched out; thus the northeast front of the Palace at Tello is accented at its centre by a panel 18.0 ft. wide and projecting 3.3 ft., flanked by pilasters in three planes, on its two wings being great half columns 1.6 ft. wide; the arrangement is repeated on the northwest face with the difference that the central panel is relieved by seven half columns, and that the projections of the wings are pilasters.(77, 1). As proved by a wall at Warka and a doorway of the harem of Khorsabad (87, 1; 88), there was still liked the appearance of a row of seven connected half columns enclosed by two pilasters, perhaps the result of that of a palisade of palm trunks. As for the grooves, they were sometimes simple, sometimes arranged with reveals (87, 1, 2; 83); sometimes a refinement, an example of which is offered by the wall of the ziggurat of K Khorsabad, alternated them with pilasters.

Such as it is revealed to us by Assyrian palaces and notably by that of Sargon at Khorsabad, the arrangement of a great Mesopotamian portal aimed at and produced a monumental effect. Sometimes triple, like that giving access to the serail at K Khorsabad, the portal, with frequently a projecting archivolt happily accenting the round arch, was pierced in an ample projection frankly detached in front, clearly defined by two a angle towers, and finally enhanced by an ornamentation both magnificent and grand.(76; 78; 79).

143 The infinite quantity of data relating to the sculpture of the isolated supports furnished to us by some rare materials, mostly graphical and originating in Assyria, announce a rational conception of forms and a pronounced taste for those of a geometrical kind. The shafts are cylindrical and plain, limited at their ends by toruses. Sometimes of bulbous shapes, sometimes as an oblong cap terminated by volutes, sometimes like a bell, the capitals appear well and satisfy the eye. (89). Certain kinds announce the future Ionic and Corinthian formulas.(89, 1, 5, 6).

As for the bases, a bulbous type is known (89, 3), and by the frequency of its representations now possessed, we may a appreciate the vogue of a kind, as decorative as original, c composed of the image of a quadruped -- bull, sphynx or lion -- on the back being placed a cushion.(89, 10; 87, 6) [1]

Note 1. An inscription of Sargon informs us that for the hekal of his Palace of Khorsabad, he had caused to be made in bronze four pairs of supporting lions, serving as bases for as many columns. Compare on page 157 the Hittite realization of the same motive.(98, 1, 2).

IV. Effects of Ornamentation.

In the first rank of the characteristics of the architecture of Mesopotamia appear the luxury and splendor of the ornamentation by which it relieved the gloomy appearance of its masonry of crude or burned bricks.

144 Effects of Materials.

At least this was masked by a coating 2 to 4 ins. thick in Chaldea, 0.1 to 0.2 in. in Assyria. When the means were at command, the lower zone of the walls was covered by a stone facing, whose material was marble at the Ziggarat of Susa; a alabaster at the Palaces of Nimroud, and basalt at the Hilani of Khorsabad; the interiors were frequently lined with wainscotings of cedar or cypress. Besides the thresholds were made of diorite or alabaster (91), and the jambs of the doorways were of the second of these materials.

In Chaldea, the geological and botanical conditions opposed the use of sculptured ornamentation. Yet in the inscriptions of Goudea relating to the erection of a temple, mention is m

made of monsters carved in cedar. On the contrary, Assyria was well provided with easily worked stone, and was pleased to use it in relief and in the round; in the Palace of Sargon at Khorsabad were counted no less than 48 colossal statues p performing the function of jambs (73), and there were sufficient sculptured slabs (92) to ralize a length of 1.44 miles 20 ft. high!

Effects of Color.

Above all, the architecture of Mesopotamia loved color and splendor. It covered the plastering with distemper paintings in polychrome and illuminated the sculptures.

On the exterior as well as the interior was lavished the u use of the metals; of bronze were made lintels, jambs and thresholds, as proved by that of Borsippa of the time of Naboukodonosor; [1] animals as supports of columns like those of the Hekal of Khorsabad; coverings of roofs like that shining on the top of the Ziggurat of Susa, according to the evidence of Assourbanipal, its destroyer. With silver and gold were covered the walls, domes and columns of the sanctuaries, of those halls and the royal apartments. It was also passionately fond of enamel, excelling in its manufacture from the most d distant times. Sometimes, as at Warka, it limited itself to scattering spots by inserting in the masonry a sort of pottery pegs, whose heads were enameled (90, 1, 2); sometimes, as at Babylon or Nineveh, with a series of tiles covered with e enamel it formed bands or arches, or even covered entire facades.(79; 88).

Note 1. Preserved in the British Museum.

Its palette was varied and rich in strong tints: It employed for fresco black, of which great use was made at the bases of the walls for a height of 1.6 to 3.6 ft.; green with which the backgrounds were coated; white was supplied by reserving the stucco; also dark red, yellow and blue. The polychromy of the sculptures was reduced to blue, vermilion and a violet tint. That of the enameled facings was dominated by a quite dark blue, which served for the backgrounds and by a slightly orange red, that tinted the motives; in a large measure, it comprised green, black and white. Certain chromatic scales

were demanded by reasons of a mystical order; such as that of the ziggarat, whose seven stories were colored, the lowest b being white, the second black, the third red, the fourth blue, the fifth vermilion, the sixth silver and the seventh gold; colors emblematic of the sun, moon and planets.

147 Choice and Interpretation of Motives. Execution.

The ornamental treasury of architectural decoration in Mesopotamia included geometrical figures and very conventional images of realities; In primitive Chaldea, these were triangles, lozenges, chevrons and spirals (90, 1); in Babylonia and Assyria, merlons (90, 5), very elegant arabesques, lotuses, palm leaves and rosettes, in the same taste though not imitations of analagous Egyptian motives (90, 3, 4, 6, 9 - 14), a and also representations of plants, like the two palms of cedar covered with gilded bronze and nearly 33 ft. high, which stood before the gate of the harem of the Palace of Khorsabad [1] ; images of animals, bulls and particularly lions, as they were painted on the walls of the sacred way of Babylon.(87, 6; 88).

As for the repertory of significant motives, it comprised the images of the gods, the illustrations of religious subjects, representations of religious ceremonies, royal ostentat-
148 ion, scenes in war, hunting and in familiar life (92); figures of fanciful animals, especially the winged bulls with human heads, which under the name of keroubs (cherubim ?) stood as mystical guards at each side of the gates, "placed there to repel the wicked", as the texts state.(73; 79)!

To the merit of remarkable execution, Mesopotamian decoration added that of appropriateness. The external sculpture w was truly monumental; the interior adapted the dimensions and the relief of the figures to the dimensions of the hall and the projection, dividing at need the surface to be decorated into spaces more or less numerous, in proportion to the necessary reduction of scale. The ornamented facings accented the great lines of the elevation, and composed simple and free h harmonies, accordant with the degree of the lighting of the place.

149 Part II. Primary Styles of Western Asia.

We have already had occasion to mention the situation anf the historical role of the primary architectural styles of w Western Asia in relation to those of Egypt and of Mesopotamia; a situation of assured dependence and of relative originality; the role of transmission to the West of the inventions realized on the banks of the Nile and the Euphrates. We shall see by numerous manifestations significant of knowledge and initiative, that they have rights to our sympathetic attention.

Section 1. Hittite Architecture.

The Hittite people, -- which the Bible calls Hittim, the E Egyptian texts Khiti, and the Assyrian Khati -- had for their own domain, on the one hand the eastern region of Asia Minor watered by the Kyzil Ermak (Halys), and which was their native country; on the other southern Syria between the Euphrates and the gulf of Alexandretta. But in some periods their empire extended westward to the Egean Sea and on the south to t the borders of Palestine.

I. Monumental Topography and Chronology. -- Human and Natural Conditions. -- Dependence and Radiation.

At the stops or intessections of the natural routes of western Asia, originated in all periods by the commercial or mil-
150 itary expansion, either of the Mesopotamian empires toward t the Black Sea or the Mediterranean, or of Egypt toward Mesopotamia in Asia, are found the known monuments of Hittite architecture. On the Anatolian plateau, toward the middle of the great curve of the Halys, at the place named Boghaz-Keui, the nucleus of all communications with the seas and the adjacent countries, may be seen the ruins of a capital, Ptenia, enclosed by strong walls, inside which are visible the substructures of a palace; on adjacent sites, called Yasili-Kaija and Enijik, appear a sanctuary and a palace; at Ghiaour Kalesi, south of Angora, remains a fortress. In Syria and at the bend formed by the Euphrates after it leaves the mountains, the strong city of Carchemis or Gargamish commanded the best ford of the river. On the road from Garchemis to the gulf of Alexandretta and south of Kasen-Ali, the positions of Sakje Geuzi and of Sendjirlic were guarded by strongly fortified cities.

The same part was played by Kadesh on the great route opened by the valley of the Orontes from north to south toward Palestine and Egypt.

In the present state of historical knowledge, we can estimate at least fifteen centuries for the duration of Hittite c civilization, from the beginning of the second thousand years B. C. to the middle of the first. Until the 12 th century, the head of the Hittite empire was in Asia Minor at Pteria, whose enclosing walls may be dated from the 14 th century and the Palace from the 12 th. The ruins of Sakje Geuzi and of Sendjirli recall a period comprised between the 13 th and 7 th centuries. In the 9 th century the Hittite power entered a decadence, and the taking of Pteria by Croesus in the middle of the 6 th century put an end to its history.

On the importance of the monumental demands of a religious character, we lack information; but we know that the secular demands were considerable, on the one hand being determined by the need of fortifications in consequence of an endemic state of foreign or civil war; on the other by the luxury of sovereigns, whose power and resources are indicated by the fact, that at the beginning of the 18 th century B. C., one of them sacked Babylon, and that in the time of Ramses II (1292-1225), another could maintain himself against the empire of the Pharaohs at its climax.

On the whole, Hittite architecture remained much behind those of Babylon, Assyria, and Egypt; from the first two of these it further demanded lessons and models. Yet in the arrangement of the planr as in the construction and in decorative invention, it made proof of a certain originality and a remarkable aptitude for realizing the programme of a fortification or a residence. Indeed, as we have previously noted -- t the arrangement of the Hittite gateway was adopted by the Assyrians, while from Tiglatphalasar to Assourbanipal, not one of their proud sovereigns but boasted of having reproduced in his palace "a hekal of the country of the Hittites, which in the language of that country was termed a hilani". On the other hand, Hittite art strongly influenced those of Phrygia and of southern Syria.

An analysis of the Hittite ruins leads to the distinguishing of two architectural formulas, one Anatolian and the other Syrian, the former applied at Pteria, the latter at Sendjirli and in a certain measure at Enijuk.

II. The Programmes and their Realization.

The Sanctuary of Yasili-Kaija, formed by the arrangement of a rocky valley, whose sides were cut and decorated by reliefs, corresponds to a ritual of worship in the open air within a sacred enclosure, in the manner of the Semites of Syria.

As revealed by the excavations of Sendjirli, the military architecture of the Hittites appears equal to that of the Mesopotamians and superior to that of the the Egyptians. To the principle of passive resistance by means of thick or multiple walls, they preferred that of an active and armed defense, due to flanking the walls by towers and to fortification of the gateways.(95, 2, 3, 4; 94). These, whether of a c city or a fortress, satisfied all requirements of their purpose, being both monumental and for passage as convenient in time of peacs as difficult in case of siege. The besiegers not only had to force two passages; they could only attack t the external barrier by exposing themselves in a sort of forecourt to the crossfire of the defenders; having passed this obstacle, they found themselves at the end of a sort of ditch, attacked on four sides at once.

In Anatolia, the Hittite palace rose at the centre of a terrace carefully isolated, and of rectangular plan like itself. At Pteria (95, 1), the platform measured 459.3 by 360.0 ft., and the edifice itself was 187.0 × 137.8 ft.; halls were arranged around a central court; at the rear were isolated the private apartments.

Among the Hittites of Syria, the royal residence was arranged according to a different principle, which became a favorite in Assyria, as before noted. In reality its arrangement was only a variant of the gateway, and the discoveries of Sendjirli permit us to follow its evolution in the sense of a distribution more and more differentiated and comfortable. (95, 5, 6, 7). By covering the forecourt and placing one or two columns between the towers was produced a vestibule of

beautiful appearance. The placing of a roof over the central court and the construction of two partitions had transformed into a suite of a great central hall and two small side halls.
153 Such appeared at Sendjirli the Hilani I,[1] contemporaneous with the 10 th or 11 th century.

Note 1. The explorers of Sendjirli have distinguished by numerals the different hilanis discovered by them.

A first advance,-- that is marked about the middle of the 8 th century by the hilanis II and III of Sendjirli,-- consists in an enlargement and improvement of the lodging obtained by the arrangement of one of the towers, by a doubling of the primitive apartment, permitting the use of one part for reception -- a great oblong hall (hekal) with a salon at one extremity (debir) -- and of one section for the domestic life, w with a division into large and small chambers. At the small hilani of the upper Palace of Sendjirli, that may be dated from the last quarter of the 8 th century, the transformation is completed by a wise arrangement facilitating the communication with the different rooms.

The hilanis opened on a court, which on occasion was bordered by a portico. The programme of these Hittite structures assigned a part to the useful, as proved by the arrangement of both halls, of canals and sewers.(95, 8).

154 III. The Construction.

Their territory supplied the Hittites with stone and wood. The latter was then as abundant in Asia Minor as it tends to become rare in our day; and the mountains in Syria offered at pleasure various and valuable woods.

The Hittite construction in Asia Minor was not identical w with that in Syria.

The former preferred stone, of which were built the entire height of the walls of fortifications and the substructures of others. For the former were employed great polygonal masses, scarcely roughed (96, 2); for the latter, blocks of pretty large dimensions (usually 4.9 ft. long, 4.3 ft. wide and 3.3 ft. high), carefully dressed on their faces, rough at the back and roughly dressed on the other surfaces. The great w walls, whose thickness attained even 19.7 ft., consisted of

loose stones between two facings of cut stone.[1] The masonry
155 contained neither mortar nor cramps; the solidity of two bl-
ocks was sometimes increased by forming their adjacent surf-
aces with projections and recesses fitting into each other.
The crowning of the great gateway of the walls of Pteria was
constructed by the expedient of corbelled courses; a postern
attests the knowledge of the radial arch.(96, 7).

Note 1. At Enjuk, they are of granite, and their lengths are often nearly 6.6 ft., the height of all being almost the same.

Hittite construction in Syria presents interesting peculiar-
ities, some of which exhibit a real knowledge.

It utilized stone in the form of boulders roughly dressed
or of blocks measuring about 35 c. ft., and an economical cut-
ting was limited to their visible surfaces and joints. It al-
so employed clay shaped into crude or burned bricks; the for-
mer contained a little fine gravel and plant refuse, measuri-
ng an average of 13.8 ins. side and 5.1 ins. thick; the latt-
156 er were respectively 11.8 and 7.1 ins. Finally, it made a
great use of wood.

Stone masonry very decidedly tended to level the beds, whi-
ch it imperfectly realized by filling with mud mortar and st-
one chips; those of bricks comprised a jointing with clay and
were quite irregular.

The wall, whose thickness even attained 16.4 ft., was comp-
osed of three parts. A solid foundation of stones entirely
buried or scarcely emerging was made of two inclined facings
of large boulders with small materials in the middle; crude
bricks composed the wall, protected by a coating of clay, pu-
re or mixed with lime; between the two was inserted a platfo-
rm of wood to level the bed of the brick portion and to make
it independent of the underlying mass of stone; this sometim-
es consisted of a row of thansverse timbers and sometimes of
a grillage of timbers alternately lengthwise and crosswise,
the spaces being carefully filled with small stones or bricks
set in clay mortar.(96, 1, 5, 6).

The Hittite architect willingly furnished the base of his
walls with a facing of stone in blocks 2.6 to 3.3 ft. high;

an arrangement adopted by the Assyrians, and whose equivalent is seen at the "cyclopean walls"of Malta, while its principle is recalled by the base slab course (orthostatis) of the Hellenic wall.(97; see Fig. 7, 3, 4 and page 292). In this case again the necessary connection was required from wood; a course of timbers placed on the upber surfaces of these stones and fixed thereto by means of tenons, made them solid with e each other, while the cross pieces in the internal mass of t the wall anchored them firmly to the structure.(96, 4).

As for the isolated supports, they consisted of a stone base and of a wooden shaft.

The covering was flat, formed of a wooden ceiling covered by a thick layer of tramped earth.

The floor was paved with burned bricks or stone slabs joined with lime mortar.

The ducts for water were constructed of pottery tubes skilfully joined (95, 8), and the sewers were channels of rectangular section in stone and covered by slabs.

IV. The Effect.

The sentiment for effect must have been foreign to Hittite architecture. It demanded movement in masses -- projection of towers and buttresses; different levels of the ground were compensated by steps; contrasts of solids and voids -- vestibules, porticos and galleries; refinements in cutting; coatings of clay mortar with or without lime; wainscoting with costly wood and applications of metals; finally, enrichment by sculpture. The doorways were particularly cared for. At Pteria, Sakje Geuzi, Sendjirli and Enijik, figures ornament the piers, there lions, here sphynxes standing after the fashion of Assyrian and Persian keroubs (97), and sculptures animate the substructure of the walls of the forecourt.(97; 98, 3, 4).

The preferred motives were animals walking, in the style of Babylon and Nineveh; lions, bulls and griffins, scenes of hunting, war and worship; finally various ornaments, such as t the rosette, fringe and winged disk. Rude, imperfect and often coarse, the style betrays strong influences from Mesopotamia, particularly after the Assyrian invasion of the 8 th c century.

A relief of Yasili-Kaija (98, 7) informs us that the Hittite

architecture of Anatolia constructed an isolated support by meams of a fluted conical shaft and a capital with volutes of Mesopotamian origin, and which we shall have to consider, when we establish the genealogy of the Ionic order.

As for that of Syria, the excavations of Sendjirli have revealed a fragment of a very carefully wrought shaft (98, 6) and of two types of base. One, which from afar exhibits the Grecian Ionic formula, is divided into five disks, that of t the centre being very thick and projecting, the others thin, the middle ones profiled as toruses and the two extremes as fillets (98, 5). The other (98, 1, 2), as decorative as original, received the shaft on a cushion resting on the back of one or two four-footed monsters, a motive already found in t the architectural productions of Mesopotamia, and which we s shall again find in the sequel in the work of the mediaeval Mohammedan and Christian architecture, as well as in that of the Renaissance.

159 Section II. Syrian Architecture.

In spite of the subdivision of its population into hostile class and the frequency of wars, Syria attained a high degree of prosperity and of civilization, at least from the beginning of the third thousand years B. C. Pressed by the economic and political expansion of Mesopotamia on the east and northeast, that of Egypt on the south, of the Egean world on the west and of the Hittite empire on the north, it necessarily was thereby influenced at first, and particularly by the former. From our point of view may be distinguished two provinces, the Canaanite and the Phoenician.

To Syrian builders were offered by nature exceptional forest resources on the heights of the southern and coast regions; these were the cedar, cypress and olive. Stone materials abounded in mediocre and soft limestones and in some lavas.

Chapter 1. Architecture in Canaan.

An Egyptian monument from the time of the V dynasty [1] attes-
160 sts that about the 27 th century B. C., the people settled in
the region of the Jordan were already expert in military structures; the continuity of their architectural activity in t the course of the third and second thousand years, and its c clixam about the 15 th to the 13 th centuries, have been revealed by the very recent exploration of the hills of rubbish composed of the ruins of the cities of Lachish, Gezer, Tannak, Megiddo and Zakarya, located from south to north at the west of the Dead Sea and of the Jordan.

Note 1. The representation of the siege of a Syrian city of the Sati by the general Anti, whose tomb is at Deshasheh.

I. Programmes and their Realization.

Architecture in Canaan was not impelled to monumental productions. The religion had no god to house and the chief portion of the worship consisted in sacrifices in the open air on a "high place". The prince's requirements was strictly li-
161 mited by the mediocre resources at the disposal of the very
small states. On the contrary, on account of the frequently excessive serenity of the sky and the extreme insecurity of a country exposed to incessant internal contests and to frequent invasions by armies from Mesopotamia, Egypt and the Hittites, it had much to construct in the way of hydraulic works

and fortifications. Indeed, in considerable number remain c cisterns, wells, tunnels and the ruins of the walls of cities and of fortresses.

The Canaaanite temple (bamoth)-- that of Megiddo offers a typical example -- consisted of a sacred area (haram) defined by an enclosure; besides a row of tall stones arranged from north to south on a terrace of small stones, its surface bore an altar for sacrifices, a ditch and basins for offerings, w while beneath it was concealed a cavity, a natural cavern, an artificial grotto or built chamber.

The tombs to be seen at Gezer and Megiddo were subterranean, composed of a sepulchral chamber excavated in the rock, or c constructed underground with a corridor for access at the bottom of a circular well.

Most honor to Canaanite architecture results from works for fortification, which show ingenuity and are very remarkable for the time. Their system, as revealed by representations on the monuments commemorating Egyptian and Assyrian campaigns, by the triumphal entrance of the funerary Temple of Ramses III at Medinet-Habou, and finally by the exploration of t the mounds in Palestine, comprised from the third thousand y years, not only a considerable strengthening of the passive resistance -- by the doubling of crenelated walls with protected bases (102, 2) and preceded by ditches with walled counterscarps, by the erection of citadels, and by the arrangement of guarded entrances with crooked passages (100, 1, 2; 101) -- with again the organization of an active resistance by means of flanking the walls by towers and bastions.(100, 3, 4, 5).

II. Construction.

The methods of Canaanite constructors present great analogies to those of Hittite architecture of southern Syria. Although for a considerable structure they preferred for economical reasons crude and dried bricks, square or oblong in form, 14.2 to 21.2 ins. long and 4.7 to 6.7 ins. thick, they freely employed the stone, that they possessed in abundance; from t the 15 th century, they used roughly dressed rubble jointed with a mortar of mud of of lime mixed with stone chips; about the 10 th century was manifested a tendency to the cutting of prismatic blocks of average dimensions and to a leveling of

the courses. The walls were built vertically on a widely spread foundation, consolidated by wooden ties embedded in the mass;[1] if built of bricks, they always rested on a stone base, forming two or three courses with a total height of 3.3 to 4.9 ft. (102, 1, 2).

Note 1. Ancient Palestine was certainly better wooded than is the present country.

The isolated support was in current use, constructed of a wooden post set on a stone base.

From the third thousand years, Canaanite construction employed the vaulted covering; this consisted of domes -- at first erected by corbelling (102, 3), and at least from the middle of the 15 th century, as shown by the tombs of Megiddo, by radial jointing; or in tunnel vaults, examples of which e exist at Gezer, that may be dated from the 11 th or 10 th century.

Until this time, nothing reveals in what measure and by what means this architecture sought for effect; it doubtless made use of plastering and of wooden wainscoting.

In brief, what we know of Canaanite architecture presents qualities in arrangement and in construction, doubtless developed under Mesopotamian and Hittite influences.

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Chapter 2. Architecture in Phoenicia and Cyprus.

The area of Phoenician architecture comprises three parts; a native country, a narrow strip of maritime Syria with the rich and strong cities of Tyre, Sidon, Byblos and Arad; a field of extension composed at one side by colonial dependencies, of which the two principal were the eastern portion of Cyprus with flourishing or illustrious cities like Kitios, A Amathonte and Paphos, and Malta in the distant west, the coasts of Sicily (Eryx), Sardinia (Suloi), the Balearic isles, northern Africa, the domain of the Carthaginian empire as far as beyond the straits of Gibraltar; finally by the adjacent region of Judea.

Established on the Syrian coast from the third thousand years B. C., the Semites of Phoenicia were entirely devoted to commerce and maritime life before the middle of the next thousand years. About the middle of the 11 th century B.C., they enjoyed rare prosperity, which lasted until about the 9 th century, an epoch in which they found strong competition in the eastern Mediterranean by the Ionian cities of Asia Minor, and in the western by the Grecian cities of Sicily and of Italy. Yet about 800 B. C. is placed the founding of Carthage.

I. Human and Natural Conditions; Monumental Chronology and Topography; Dependence and Radiation.

The civilization that supported Phoenician wealth was brilliant, but its architectural expression could only be secondary. Besides that its population was sparse, all devoted to the sea and for a great part half nomadic over the extent of the Mediterranean, the practice of Phoenician rites, like those of the Semites in general, did not require edifices. Yet the Phoenician architects distinguished themselves by considerable works of civil and military engineering -- the ports and fortifications of Tyre, Sidon and Carthage, and by the c creation of great sanctuaries like those of Melkart at Tyre and Gades; those of Baal, Echmoun and Tanit at Carthage;[1] those of Astarte at Sidon, Byblos, Amathonte and Paphos in t the island of Cyprus and on Mt. Eryx in Sicily; finally by t the erection of important funerary monuments, such as those of Amrith. To these properly Phoenician productions it is

proper to add those occasioned in the 10 th century by the establishment of an Israelite kingdom by David, and the accession of an ostentatious sovereign in the person of his son Solomon; for the great structures of Jerusalem -- the Palaces of David and Solomon and the Temple of Jehovah -- were executed "under contract" by Hiram, the king of Tyre.(969-936) [2]

Note 1. Of Punic Carthage no authentic remains exist.

Note 2. The temple was destroyed by a lieutenant of Naboukodonosor in 588. After the end of the captivity of Babylon, a new Temple was built, inferior to the former.(516). In its turn this was replaced by a magnificent edifice conceived by king Herod and erected frog 18 B.C to 64 A.D. The last Temple disappeared at the time of the ruin of Jerusalem in 70).

The Antiquities of the Jews by the historian Josephus have preserved its description. See further, page 167, Note.

The Phoenician school of architecture was developed under the double influence of those of Mesopotamia and of Egypt,[1] and the exports from Tyre and Sidon actively contributed to the diffusion of some of their relief forms and their decorative motives in Asia Minor, and in the Egean world.

Note 1. Phoenicia was conquered by Egypt in the time of t the XVIII and XIX dynasties.

II. The Programmes and their Realization.

A programme for a Phoenician temple was very simple; a great court was surrounded or not by porticos and formed a sacred area (haram), on which rose an altar for sacrifices and a tabernacle before the entrance,and placed at the east stood a pair of columns.(105, 1, 2, 3). [2]

Note 2. At Amrith the court formed a rectangle 180.5 by 157.2 ft.; the tabernacle was a niche cut on a cube measuring 12.1 ft. on each side, set on a base 9.8 ft. high and accessible by steps.

Compare the arrangement of the Phoenician temple with that of the Sanctuary of Mecca, which presents a court with the b block of the Caaba at the centre.

Yet it was susceptible of extension by the duplication of certain elements, an illustrious example of which is offered by the Sanctuary, that Solomon erected at Jerusalem.(106). The court is there divided into an outer court and a "haram"

with altar. The tabernacle, the house"where Jehovah had promised to dwell among the children of Israel", was devided like a dwelling; it comprised successively from east to west a vestibule (elam), a hall (hekal) with the altar of perfumes, the candlestick with seven branches, the table of shew-bread, and finally a holy of holies (debir), the shelter of the ark of God; in bried the arrangement of a Hittite "hilani"! Along the longer sides and the rear rose three stories of little cells extending to mid-height of the facades, and above w which were pierced windows.[1]

Note 1. The dimensions were a total of 70 cubits for the length (105 ft.), 10 for the vestibule (17.2 ft.), 40 for the hekal (69.0 ft.), and 20 for the debir (34.5 ft.): 20 cubits for the width (34.5 ft.) and 30 cubits for the height (51.6).*

The Temple of Herod measured 6 stadions in perimeter (more than 3600 ft.). The external court, called the court of the Gentiles, was bordered on three sides by a double portico and at the south by a basilica with three aisles. A low wall 3 cubits (5.2 ft.) high outlined the haram proper, that was reached by a stairway of 14 steps. In its turn it was divided into a forecourt enclosed by buildings and by galleries to w which the women had access (women's court), and a rear court termed the court of Israel, likewise surrounded by halls and porticos. Then was the court of the priests,in the middle of which rose the altar of burnt offerings. At the west of the altar was a terrace 9 cubits (15.5 ft.) high, which supported the House of Jehovah, rebuilt in white marbel as Solomon had designed it.

"When the rays of the rising sun fell on the sheets of metal covering the gates and the roof of the sanctuary, when they lit up the gilding of the facade and the colossal golden vine, which coiled on the white marble of the vestibule, the dazzled eyes must be turned aside", says Josephus, - -"and t the stranger perceiving the Temple from afar, believed that he saw a mountain covered by glittering snow". (See De Vogue, the Temple of Jerusalem).

As it appeared on the conventional representation presented on a coin, the Temple of Paphos consisted of a court enclosed

by a balustrade and of a columnar sanctuary, its entrance marked by a lofty pylon.

The programme of a palace, so far as we can imagine it by the interpretation of the descriptions of the residence of S Solomon presented by the Bible, according to oriental custom distinguishes the serail and the harem, composing the former of several rectangular columnar halls preceded or not by porticos, and of a throne or "judgement" hall. The columnar hall of Solomon measured 100 × 50 cubits (172.3 × 96.1 ft.) with a height of 30 cubits (51.7 ft.)' a series of 45 columns separated three aisles.

The construction of aqueducts, cisterns and sewers was familiar to Phoenician architects.

The location of the tombs was arranged, either in the sides of rocks in the form of artificial grottos, or in the depth of the ground in the shape of a vault accessible by a stairway or a well.(105, 4, 5). In the second case, the sepulchre was completed by a monument (1045 108, 2, 3). Sarcophaguses or "ovens" received the bodies.

III. The Construction.

At the time of their climax being possessed of iron tools, the Phoenicians were skilful carpenters. More than the Syrians of the interior, they were rapid and ingenious miners and quarrymen, not only for excavating trenches, chambers and tunnels, but likewise for sculpturing walls and even parts of edifices. Thus at the Temple of Amrith the court is a pit excavated in the rock, the base of the shrine being a block left in the solid, while at the same place an entire house was produced by a combination of excavations and reservations in t the rock!

Phoenician construction emphasizes a very pronounced taste-- further explained by reasons of a practical order -- for the use of blocks of great dimensions. Commonly, as shown by the walls of Arad, it required blocks measuring 13.1 to 16.4 ft. long by 9.8 ft. high. The ancient portions of the walls of Jerusalem exhibit such with lengths of 23.0 and even 39.4 ft with a height of 6.6 ft.(109). Yet at Baalbec is the triumph of this mode, since there in the Phoenician substructure of

the Temple are three monster monoliths, respectively 60.7, 6 63.4 and 65.0 ft. long. (107).

Sometimes, as at Baalbec, the cutting was rough; sometimes -- as the case with the retaining walls of the Temple at Jerusalem,-- it was careful, with sunken drafts around the block. (109).

The masonry was irregular and not joined by mortar; on the contrary, it comprised anchoring by layers and grillages of beams, a favorite with all the schools of western Asia.[1] The courses of the retaining wall of the Temple of Jerusalem are each set 2 ins. behind that next below; elsewhere the Biblical texts inform us, that the walls of the House of Jehovah rose in stepped form, their surfaces receding one cubit to e-each five cubits in height.

Note 1. See in I Kings, VI, 36, the passage with the description of the court of the Temple, where is the mention of three courses of stone surmounted by a layer of cedar beams.

A remarkable peculiarity of the architecture of the Phoenicians -- otherwise in harmony with the military bent of their genius -- is the use in construction of rubble of stones or pebbles connected by mortar, a favorite with the Hittite and Canaanite builders, as we have noted. Progress resulted both in the adoption of a system of building walls by casting and tamping in wooden forms, whose originality is stated by Pliny the Elder, and by replacing the mud or clay by a mixture of lime and sand; as much as to say that Phoenician masonry employed concrete.

The use of the isolated support was familiar to Phoenician architects, who made it of stone and especially of wood.

The ordinary mode of covering was by a ceiling under a terrace, but the substructure of the Temple of Jerusalem , and at the western wall of the terrace, the fragment of the arch of a bridge, with a span of more than 49.2 ft., proves that the Phoenicians knew and applied in a remarkable way the principle of the radial vault.

IV. The Effect.

In Phoenicia, the mode of construction produced a large part of the effect. That it was not indifferent to that result-

resulting from the monumental sculpture is proved by the relatively animated form of some remaining monuments and by the embryo treatment exhibited by them. (104; 110).

Certain outlines -- for example those of the tombs at Arad and at Amrith (108, 2) -- recall an Egyptian type suited to the necropolises of upper Egypt.[1] Others appear more original; such as that of a Tomb of Amrith (104; 108, 1), similar to a series of receding cylinders, the last being terminated by a sort of dome perhaps imitating the phallus, a symbol of immortality; such again as that of Kabr Hiram (108, 3) with its top in gabled form, that it repeated in tombs of the necropolis of Amathonte in Cyprus.[2] Likewise for the profiles; besides the Egyptian cavetto, a favorite crown of walls in a all epochs (110, 3, 4), and the crenelations of Mesopotamia, that appear also to have been the fashion (110, 5), the Phoenicians employed others, reproduced in Fig. 110.(1, 2, 6, 7).

Note 1. See page 79, Fig. 47, 5-7.

Note 2. A singular resemblance of the general outline of Kabr Hiram is approximated by the Tomb of Cyrus at Pasargade. (Page 398).

As for the secondary forms, the sculpture of the capital d does honor to the Phoenician-Cypriote art. It indeed compri-
172 ses a certain variety of forms, some as agreeable to the eye as appropriate to the structural function of the member, and which may be referred to two types, one shaped either in basket form with geometrical outline (111, 3, 6), or in the image of an expanded flower (111, 7); the other being a more common realisation on account of the marked preference of Phoenician architecture for the square pier, presenting the appearance of a rectangular tablet supported by the volutes of two divergent lotus petals, erect or recurved (111, 2, 4, 5), or by a bouquet surmounting them.(111, 1).

Phoenician architects shared with all their colleagues in the east the passion for precious materials, brilliant colorings and sumptuous decorations. Thus they made of bronze or even of gold and of lapis lazuli,-- if we believe Herodotus-- the columns erected before the entrance to the Temple; they covered the walls with dazzling stucco, with wainscoting of

cedar, cypress and plates of metal. In the House of Jehovah at Jerusalem,"from the pavement of the edifice to the beams 173 of the ceiling - - - all was of cedar, not a stone being visible, ---" the debir being "lined with pure gold - - - even to the last detail ,- - - as far as "to the groundh6

The ornamentation comprised sculpture in very low relief or engraved. The favorite motives of the decoration were mostly of Egyptian or Assyrian origin; these were on the one hand t the lotus, winged disk, uraeus, on the other being the palm, rosette, crenelation, twisted fringe; the decorators of Phoenicia always modified certain forms, notably that of the lotus, even creating marked variants of a suitable character. (112). The Biblical texts inform us that at Jerusalem cedar was carved in knobs and garlands of flowers, and they engraved on golden coverings, not only palms and flower wreaths but also cherubim.

174 Book III. First and Second Epochs of Egean Architecture.

To the group of oriental schools just surveyed, the historian of ancient architecture finds opposed a western one, whose area extends over the West of Asia Minor from the Bosphorus as far as Cyprus (Troad, Phrygia, Lydia, Caria, Lycia); Greece, Archipelago, central Italy (Etruria) and southern Italy (Magna Grecia and Sicily).

The Egean Sea, around or near which are located these different countries, played such an essential part in their life, that its name is chosen as the title of a general presentation of their architectural productions.

The legitimacy of their united conception results from the relative community of the civilizations developed under analagous physical and human conditions, which were in relations more or less intimate, and were in different degrees subject to the same artistic influence.

Particularly during this phase of growth, all were really dependent on the East, the effect of which was further remarkably facilitated and even necessarily determined by geography. Without mentioning the certainty of their penetration into w western and maritime Asia Minor through the channel of the neighboring Hittite and Syrian civilizations, the Mesopotamian inventions and Phoenicians from the 13 th century must be disseminated afar by way of the coast, thanks to the form of the Egean region, entirely in peninsulas and islands distributed with small intervals; on the other hand the regularity of the Etesian winds, alternately directed from north to south in winter and from south to north in summer, permitted relations with the more distant Egypt.

175 Yet if this dependance and borrowing occurred, there never was a servile imitation, and the part of the ancient East in the work of Egean architectural styles particularly consisted in the contribution of efficacious ferments and of some germs, which they naturalized in their domain. Finally, they ended in the formation of an artistic personality, that in its turn radiated afar from its cradle, even reacted on the East and proposed models, whose prestige has not been lost in the twenty centuries since.

The historical development of this family of architectural styles may be carried back to the borders of the neolithic age, even to the fourth thousand years B. C. But one cannot give it the honor of an artistic production before the beginning of the second thousand years. Since its vitality was prolonged until the 15 th century of our era, by about thirty five centuries is measured its place in time.

The entire Egean region makes proof in various degrees of aptitude in exercising the art of building; however, certain privileged domains are distinguished by superior powers; at the head are Crete, Ionian Asia Minor, Attica and Byzantium; a place in the second line falls to Greece, Sicily, Magna Grecia and Etruria.

Although the collective history of the two first epochs of Egean architecture manifests in good measure a united and progressive development, two great periods may be distinguished therein.

A first precedes the 12 th century B. C. and is that of the production of two sister schools, the Cretan and Mycenean, t the latter a younger relative of the former, not making a start until after the elder one became extinct about the 12 th century. This will form the subject of a first part, divided into two chapters.

The second commences about the 9 th century and likewise c calls for a division of its study into two sections: a prehellenic, comprising the Phrygian, Lydian, Carian and Lycian architectural styles of Asia Minor and that of Etruria, between the 9 th and 5 th centuries B. C.; a second is devoted to Hellenic architecture from its beginning in the 8 th century to the extreme limit of its old age in the 3 rd century A. D.

As for the third flowering of the Egean styles of architecture -- that fulfilled as a function of Byzantine civilization from the 6 th to the middle of the 15 th century A. D. -- we shall reserve its examination for the second volume of this work.

Part I. Primitive Egean Architectural Styles.

Single Section. Cretan and Mycenean Architecture.

Chapter 1. Cretan Architecture.

By its insular conformation, that preserved it from the mi-

miseries of war and the restraints of military domination; b by the hospitable nature of its coast and its position in the vicinity of an archipelago, at nearly equal distances, and t thanks to the perfect regularity of the winds so favorably d directed, within reach of Asia, Africa and of Europe; finally by the qualities of a people endowed for art as for industry, Crete was predestined for a brilliant prosperity and a high civilization. [1]

Note 1. See the application made to Crete by Homer of the epithet, "with a hundred cities", and that attribution by Thucydides to Minos of an empire over the greater part of the "Hellenic Sea", particularly over the Cyclades, most of which he had colonized".

I. Human, Natural and Technical Conditions. -- Influences. Cretan architecture met with very favorable conditions.

Doubtless it was no more urged to undertakings in fortification than to works with a religious purpose; before that England before the letter (anticipatory), that was Minoan Crete, there was necessary no bulwark other than its fleet, and it had no sanctuaries other than little oratories included within the palaces of its princes.

On the other hand, it had to satisfy important requirements of a civic nature, the arrangement of the sites of cities, t the establishment of roads, public works -- with an ample demand for funerary monuments, and particularly for habitations; princely mansions, villas and houses suited to a rich and refined civilization, a lover of comfort as much as of splendor; royal palaces on account of powerful and magnificent sovereigns, not favoring temporary lodgings or slight structures like the orientals, but rather durable dwellings of monumental construction.

Likewise propitious were material and technical conditions. The island furnished very good earth for bricks and pottery; its substratum had various sorts of stone, none of which indeed was very remarkable, but all of these could be utilized and one was valuable for facility in cutting; in one part being a rather coarse limestone of black color, which did not please the eye, but was very well adapted for construction;

a homogeneous gypsum, that could be cut in great blocks as w well as in thin slabs, and in varieties approaching marble or alabaster, but not resisting weather. Finally, there was an abundance of native woods, and thanks to the activity of the Cretan vessels, an opportunity to secure in Syria cedar and cypress.

In the number of favors from nature should again be counted the diversity of the climate of the island; comprising at the same time great heat, violent winds, it imposed on Cretan architecture the solution of the problems of distribution and construction entirely fitted to make it advance.

It likewise benefited from an industrial impetus, of which proofs abound, and whose memory is preserved by the legend of Dedalus; it owed to this great facilities for the execution of the workmanship; the possession of bronze tools comprising the sand saw and drill, the toothed saw,[1] axe and chisel; finally the application of rudimentary mechanics.

Note 1. One about 6.6 ft. long has been found, which doubtless served for sawing stone.

The position of Crete at a crossing of the maritime routes of the eastern Mediterranean placed it very early in regular relations with Egypt and with such advanced posts of Mesopotamian civilization, as were always Syria, Cyprus and Asia Minor, so that Minoan architecture could profit by experiments made on the banks of the Nile and of the Euphrates.

II. Monumental Topography and Chronology. -- The Epochs.

Considered in the properly artistic phase of its career, t the history of Cretan architecture covers a space of about s six centuries from the 20 th to the 15 th century B. C., in system of computation advocated by the learned discoverer of the ruins of Knossos corresponding to the "middle Minoan" epoch and to the "first and second epochs of the recent Minoan period".

The activity of Cretan architecture and its ability -- in the various parts of the art of building in the "middle Minoan epoch" -- that is from the time of the XII Egyptian dynasty in the course of the two first centuries of the second thousand years -- is attasted by the ruins of the "ancient Pal-

Palaces" of Knossos .nd of Phaestos. That first flowering w was arrested by events, that caused the destruction of those edifices.

Their reconstruction during the "third epoch of the middle Minoan period" (18 th to 17 th centuries) was the work of a matured art, to which likewise should honor be given for the great royad Tomb of Isopata on the hills of Zafer Papoura, 1969 ft. north of the Palace of Knossos. In their turn, the monuments designated by the name of the "New Palace" suffered catastrophes.

A third architectural period -- very brilliant -- correspo-nds to the two centuries (16 to 15 th) during which lasted t the "first" and "second" epochs of the recent Minoan period". From it dates the throne hall of the Great Palace, the Little Palace and the Royal Villa of Knossos; the Villa of Hagia Tr-iada, and in the same place a necropolis with an important tomb. [1]

Note 1. At Gournia in the north of the island, at Palaika-istro in the islets of Pseria and of Mochlos, that emerge fr-om the gulf of Mirabello, at Philapopi in the island of Melos etc., have likewise been uncovered vestiges of Minoan archit-ecture, but very inferior to those just cited.

About 1400, in its full expansion and progress, Cretan arc-hitecture again met an overturn, that ruined all its product-ions. This was doubtless the effect of an invasion from the north of the legendary Pelasgians or rather Achaians, among whose descendants belong the Homeric heroes.

But the conquerors were related to the vanquished by commu-nity of civiliсation if not of origin; for there occurred, n not a disappearance, but a slow degeneration of the "Minoan" style in the course of a period termed the "third epoch of t the recent Minoan period". Thus it becomes necessary to note as a characteristic trait of Cretan architecture the continu-ity and unity of its development.

Asia Minor (second city of Troy),which appears contemporary with the beginning of the second thousand years;the Archipel-ago (ruins of Philakopi in the island of Melos); Greece, were the theatre of architectural production synchronous with that of Crete, but which could not sustain a comparison with it.

180 III. Programmes and their Realization.

181 The programme of the Cretan palace was remarkable appropriate to the physical conditions and to the purpose of the edifice.

For the exercise of the functions of the prince, political, judicial and priestly, it provided state apartments -- indeed with very modest proportions -- with vestibule, throne, benches and sanctuary, typical specimens of which are presented by the "throne hall" in the western wing of the Palace of Knossos and by the "basilican hall" in the Royal Villa at the same place.(115, 2, 3).

The private life of the sovereign found a comfortable and pleasant location in apartments skilfully conceived to associate without confusion private life and that connected with others; no jealous isolation after the oriental custom; no secluded dwelling for women; but only as proper a frank separation of local officials, of private and common apartments,
182 and numerous communications by means of galleries, corridors, stairways, apparent or secret. At Knossos (115, 1) the arrangement comprised a hall of great dimensions -- it occupied an area of 430.6 sq. ft. --, that might be doubled by opening the doors of the antechamber, even trebled by the communication of the latter with an adjoining portico;[1] a living chamber widely opening on two small courts, one of which was separated from it by a little portico; in the vicinity being a bathroom; a little removed but easily accessible were latrines, arranged on the system of "everything to the sewer" with water supply; finally a gallery with columns provided an ample view.

Note 1. At Phaestos, this was a room with three aisles.

Cretan architecture was ingenious, and in large measure it succeeded in protecting men from heat and the excessive light of summer, as well as against the too great dampness of the rainy season.

For the halls in the ground story was adopted a system of indirect lighting by taking the light from a small court; most of these "light shafts" [2] were open from the top as indicated by making their bottom of concrete and its inclination

suited to remove rain water; they were always covered therewith, with an opening for light in their upper part.

Note 2. This is the proper term employed by the reports of Cretan excavations. On our illustrations, they are represented by cross hatching and by the letter P.

The assignment of a good average height (12.1 to 12.5 ft. to the rooms favored ventilation, while communications in the s shade was ensured by a method of surrounding the courts by p porticos about 6.6 ft. deep.

On the other hand, opportunity was given to live in the second or over the third story in apartments as comfortable as those of the ground floor, bordered by open galleries and easily accessible by commodious stairways with wide and low steps.[3] (115, 1; No. 3, 4; 122; 123). Walks facilitated in r rainy weather the passage over certain spaces without roofs. (116 J).

Note 3. Tread 17.7 to 27.6 ins.; riser 3.9 to 4.7 ins.

Care for hygiene was carried very far; a large supply of water was ensured, either-- as the case at Phaestos -- by cisterns of very remarkable construction, or -- as at Knossos -- by aqueducts made of terra cotta tubes with sockets.(117, 2).
123 The removal of rain water and sewage was performed by a rational system of sewers, terminating in collecting sewers.(117, 1; 115, 6).

The progbamme of a Cretan dwelling comprised a little oratory measuring about 4.9 sq. ft., a receptacle for fetishes, vases, and of tables for libations. Doubtless one should attribute a religious purpose to the small sunken areas accessible by steps, and whose various examples in the Palaces of Knossos and of Phaestos present very similar dimensions.[1] (115, 2). Yet there exist small and better characterized sanctuaries; those revealed by the excavations of Phaestos w were composed of three small communicating halls with an annex.(118, 1).

Note 1. 8.4 by 6.0 ft.; 7.4 ft. square; 7.2 ft. square. They are generally regarded as bathrooms; but their wainscoting in a material injured by water -- gypsum or alabaster -- and the absolute lack of means of supply and removal of the fluid excludes this hypothesis.

The necessary complement of every important habitation was a considerable group of storerooms (115, 5), whose arrangement in very long cellars was appropriate for the classification of articles, while their preservation was favored by a constant temperature due to the very great thickness of the walls. The floors of some received hiding places in the form of stone coffers with average dimensions of 2.3 × 1.3 ft. with a depth of 3.9 to 5.6 ft. (121, 1).

Cretan architecture also employed schist, which was quarried in squares,
186. a little imported marble, and particularly native alabaster, in the form of admirably prepared thin slabs, whose thickness never exceeded 0.8 inch for surfaces of 10.8 sq. ft. or more!

It made coatings of plaster and of stucco, prepared a cement with a hardness and adhesion equally remarkable, and possessed formulas for an excellent concrete comprising also a mixture of lime, pulverized limestone and pebbles, or of lime, clay and pebbles.

Primarily in all cases and thereafter in most, Cretan construction was a masonry of small stones, connected by abundant clayey mortar and clamped together with wood. (121, 4).

The builders of the Palace of Knossos erected their walls in two stories, superposing on a substructure of gypsum or limestone an elevation in small stones, crude bricks, or a f front of wood and earth.

The masonry of the base was very carefully executed; on so-
187 lid foundations was set a course of thin blocks forming a strongly projecting footing, that in its turn bore a very regular mass of the blocks, whose cutting has been praised. (121, 2; 114). The beds were perfectly regular, the joints always broken and sometimes alternating. The first course was higher than the others, an arrangement recalling Hittite practice (page 156), announcing a method very characteristic of Hellenic construction. (Page 292). Sometimes the setting was dry, and sometimes it comprised the interposition of a thin layer of clay mortar.

The structure of certain walls, particularly of those of t the storerooms of Knossos, exhibits care for economizing cut

stone. It comprises indeed two faces in blocks of gypsum 1.6 ft. wide set 3.3 ft. apart and connected at intervals by timbers let into gains; the void is filled by a mass of stones. (121, 3). Note as a curiosity, slabs joined by tenons after the manner of carpentry, examples of whilh are presented by the stone coffers of the storerooms of Knossos.(121, 1).

The doorways were flanked by jambs that primitive Cretan a architecture made of limestone, and which that of the great epoch constructed by means of a frame of wood with a filling of plaster, set on a low plinth of gypsum.(121, 4, 5). The opening of a window was enclosed by a frame of wood.

Isolated supports were composed of two parts, a shaft in w wood and a base in stone; for porticos their spacing was 8.2 to 13.1 ft.

The material of the floor varied according to the place: in the courts were flags of limestone; in the light shafts was cemented concrete; in the halls being sometimes a bed of tamped clay, a coating of stucco, or a layer of cement, sometimes squares of limestone, of gypsum or again of carefully jointed schist.

Stairways received steps of gypsum or of limestone.

Roads and walks were made of two rows of jointed slabs, that measured up to 8.2 × 2.0 ft.

Aqueducts were in terra cotta; sewers were built without a covering by slabs.

The covering was by means of ceilings of woodwork; in the "basilican hall" of the Royal Villa of Knossos, main beams of enormous size, 31.5 × 23.6 ins., supported a layer of round timbers measuring 17.3 ins. in diameter. As for the roof, it was sometimes a terrace of tamped earth, sometimes a ridge w with two slopes.

V. The Effect.

Cretan architecture balanced a very strong taste by a developed feeling for harmony.

The exteriors of its edifices are too ruinous for us to correctly appreciate the effect and the success of its search f for grand monumental appearances. Yet enough remains to assure us, that it esteemed these and knew how to realize them.

It does not appear to have sided with those, who produced grandeur in dimensions; no more for the whole than for the elements did it aim at the colossal, the most ample of its c conceptions being the court of honor of the palace, realizing at Phaestos an area of 11,163 sq. ft.(162.5 × 73.1 ft.), and at Knossos one of 18,880 sq. ft. (198.5 × 95.1 ft.).

On the other hand, it was pleased by picturesque arrangements, shown by its system of forming the site of the palace in terraces; of constructing monumental portals -- at Knossos an avenue bordered by a double portico, and at Phaestos a grand flight of twelve steps 44.3 ft. wide, leading to a further p proof is the establishment of great stairways and theatrical arrangements like that of the throne hall at Knossos, and particularly that of the "basilican hall" in the Royal Villa at the same place, with its distribution -- like that of a mediaeval church -- into a vestibule, a nave and a choir isolated by a screen on a parapet, and an apse with a throne.(115, 2,3).

The part of attention and sympathy, that obtained for Cretan architecture the effects of harmonic order, is recognized and measured by the choice it invariably made of a rectangular form for halls as for courts; by its custom of arranging the palace in reference to an intersection of axes respectively orientated from north to south and from east to west, a and again by the symmetrical regularity of its compositions for the facades of houses.(116; 120).

Without having carried far the search for effects of secondary relief, Cretan architecture did not fail to attempt and to realize some of them; such as those produced by the stepped parapet and slab bordering its internal stairs (115, 4; 1 122), the rough sketch of the model of a wall formed by its place on a plinth (121, 2), and particularly the shape imposed on the isolated support.

This was composed of a shaft between base and capital. The former was sometimes cubical, sometimes cylindrical, 0.6 to 2.6 ft. high with horizontal dimensions of 2.3 to 2.6 ft. The shafts, whose lower diameters appear to have been 1.4 to 1.5 ft., were sometimes cylindrical, while others were reversed frustums of cones.(124, 1, 4; 122). The existing representa-

representations do not show any flutes; but the excavations of Knossos have revealed the existence of trunks with 20 grooves and of others twisted spirally. As for the capital, it sometimes consisted of a rectangular cap (124, 2), sometimes of one or more slabs with connection to the shaft by a cushion in the form of a hemisphere or of disks in convex slices. (124, 1, 4; 122).

Yet to the effects of ornamentation passed the favor of Cretan architecture.

And forst to those of the material; that produced by careful cutting and accurate jointing of the stones; more again those resulting from a facing of that Gypsum-alabaster possessed by the wall is found, or a coating of fine stucco, perfectly polished; and likewise that produced by overlays of precious woods, metals and faience.

Decoration in relief was rare. On the other hand, the greatest prat was assigned to a polychromy, generally very successful; the alabaster and stucco were tinted to give them the appearance of marble or jasper, or again they were covered by frescos, particularly with red and a sky blue or marine blue tending to green was the Cretan palette charged; it likewise bore yellow, brown, white and black.

Motives were sometimes taken from realities, sometimes invented after the general method.

In the first case, there were images of plants, animals, human beings represented in a freely naturalistic or conventional taste; terrestrial or maritime landscapes; warlike, religious or natural causes.

As for the ornamental repertory, without speaking of religious emblems such as a pair of bull's horns or a double axe, (125, 5, 6), it comprised (125) disks (125, 7; 120; 124, 3), the decorative survivel of a structural appearance, that of the ends of woodwork of round trunks; very ornate rosettes, frets, spirals, chess-boards, palm leaves, imbrications, zigzags, and guilloches, an ornament very similar to a pair of interrogation marks opposed and reversed (125, 7), and an element of a very elegant frieze composed of two palmations diverging from each side of a vertical band.(125, 1).

192 Chapter 2. Mycenaean Architecture.

In the present state of historical knowledge, the area of Mycenaean architecture -- that of the civilization reflected in the Homeric poems -- comprises; on the one hand Greece, a and more particularly Argolis, Laconia, Attica, Beotia and Thessaly; on the other the Archipelago, Crete and the Troad. Therefore the name applied to it because of the importance of its remains at Mycenae and of the prestige of the capital of Agamemnon, does not appear sufficiently extensive.

It is no more satisfactory with regard to the comprehensiveness of the term, because in reality Mycenaean architecture is a branch derived from the same trunk as the Cretan, but 1 later and less fruitful, developed in the shadow of its elder style, from which it is always differentiated by notable peculiarities.

Yet since the name in question is hallowed by use, we shall retain it.

I. Human and Natural Conditions. -- Monumental Topography and Chronology. -- Dependence and Radiation.

Not before the middle of the second thousand years did Mycenean civilization flourish, peculiar to the Achaians, nor d did architecture begin to receive from it appeals, which were to become considerable and numerous.

Doubtless no more than in Crete were temples demanded, the worship then having no need, except for an altar in the open air with a pit for sacrifices. On the contrary, it was very much practised by powerful and wealthy princes, whose type a and customs are sketched for us by the Homeric poetry.

Note 1. See what is said in Homer of Mycenae, "full of gold" and of "splendid houses"; of Orchomenos, the capital of the Minyan dynasty, "into which flows such wealth", and where there are "so many precious things in the houses".(Il. IX. 381 - 382).

And first the predominant place that war appears to have h held in their lives produced the necessity of fortifying vil-
193 las and fortresses; shown by the defenses of Troy, reduced to the substructures; the fortress of Mycenae, of which imposing parts still remain, particularly the Gate of the Lions; the fortress of Gla or Goulas on an islet of Lake Copais, of whi-

which the plan has been recovered; especially the fortress of Tiryns, celbrated on Homer for the strength of its walls, which Pausanias did not hesitate to equal to the pyramids of E Egypt.

The Achaian sovereigns further required for their own lodging and for that of a multitude of faithful followers and mercenaries, for brilliant displays and finally, for the preservation of the treasures essentially natural, a palace with a annexes, commons and storerooms, of which an idea may be formed by the ruins of Tiryns.[1]

Note 1. Let us recall the discovery on the Athenian Acropolis at the east of the Erechtheion, of vestiges of the Palace of the kings of Attica in the Mycenean epoch, the legendary "Palace of Erechtheus", less important dwellings at Philakopi in the island of Melos; at Amorgas, in Crete etc.

Finally, they desired substantial and monumental funerary lodgings, that are made known to us by the sepulchres in the interior of the citadel of Mycenae, the great neighboring tombs called "Treasury of Atreus" or "Tomb of Agamemnon" and the "Tomb of Clytemnestra" or "Small Tomb", the "Treasury of Minyas" at Orchomenos and other sepulchres of less interest at Menidi and at Spata in Attica, at Dnimini near Volo in Thessaly, at Vaphio south of Sparta etc.

Toward the middle of the 12 th century, the development of Mycenaean civilization found itself arrested by the owerturn resulting from a great ethnic revolution, whose stage was the eastern Mediterranean. A migration from north to south precipitated the Dorians upon Greece, who dispossed the Achaians. These necessarily ceased to incite architecture to great undertakings, and their conquerors were too rough and too much occupied in the effort of their settlement for a long time to have the wish or the leisure to make up for them.

Since it was not before the Hellenic epoch, in the region now concerning us, that the art of building made its entire flight, we shall reserve for the second Section of the second Part of Book III the analysis of the conditions there provided for architecture by nature. (Page 256). For the present we shall limit ourselves to noting the analogy of its climate to that of Crete, from which it is distinguished only by less h

humidity and greater cold; the abundance of its resources and the admirable quality of certain of its rocks; finally the existence at that distant time of forested areas, which we have some difficulty in imagining by reason of the present disforesting of the same places.

With regard to technics, Mycenaean architecture found itself nearly on the same footing as the Cretan: at least so far as the tools, for in what concerns the skill of the workmanship, it appears to have been less favored.

Without speaking of its close dependance on Cretan art, it was affected by the radiation from the East, Egypt, Mesopotamia and Syria; in its turn it was to strongly influence the infancy of Grecian architecture.

II. Programmes and their Realization.

The elementary type of the Mycenaean dwelling comprised a great chamber at the rear of an enclosed court, the shelter of the bed and the hearth, preceded by a vestibule and adjoined by a small room.

A development of this formula composed the programme of the mansion of a noble or the palace of a prince, such as that of the Citadel of Tiryns.(127). At the entrance of the enclosure, it had the proportions of a small structure formed of two porches set against each other, which bore the significant name of outer gate (prothyron, propyleion) (127, 1; Nos. 4, 6; 128); and it divided the court into an external and internal courts bordered by porticos.

As for the residence, there is clearly distinguished after the oriental manner, a quarter devoted to the public and another was reserved for the private life; both otherwise were conceived on the same plan, whose essential element in depth was a rectangular hall, at the centre of which was a hearth, and which was entered through a vestibule. The part corresponding to the harem (128, 2, Nos. 10 - 15) is characterized by the addition of sleeping chambers (thalamoi); the serail by an enlargement of the proportions,[1] by a more complex vestibule divided into a columnar porch (aithousa) and an antechamber (prodromos) (Nos. 5, 6), by a larger hearth, by the erection of a propyleion at the entrance of the forecourt, a

and finally by the establisnment of an altar for sacrifices at a point in it opposeti tne facade of tne magaron.(128,2).

Note 1. At Tiryns, the megaron of the serail occupies an area of 1238 sq. ft.

Outbuildings and storerooms adjoining tbe palace or cells in tne thickness of the enclosing walls; cisterns, aqueducts, sewers and bathrooms were the necessary complement of a Mycenaean residence.(127, 1; 128, 1, 2).

Although closely restricted by the necessity of defense and
by the topograpny of the locality, the plan of a strong fort-
197 ress like that of Gla (128, 1) no less retained the essential
arrangement of a Mycenaean palace; it clearly isolated a ser-
ail with vestibule and megaron from an entirety composed of a
harem with megaron, chambers and a treasury.

Mycenaean fortification was comparatively intelligent; the enclosing wall of Troy, the citadel of Goulas, that of Mycenae, and particularly that of Tiryns snow a knowledge of utilizing the natural advantages of a position, and of developing them by tne erection of thick walls, sometimes with casemates, by tracing enclosures with abrupt angles, by flanking them by means of bastions or towers; by an arrangement of external a access forcing the assailant to expose his right side, unprotected by the shield, to the missiles of tne garrison (127, 1, Nos. 1, 2, 3); finally by an arrangement of crooked corridors and of gateways with internal vestibules after the Mesopotamian and Hittite fashion.(1275 2; 128, 1, 2, No. 15).

Mycenaean architecture realized three sorts of funerary pro-
grammes. The first and most ancient enclosed a rectangular
pit by four small walls and a covering of slabs, masking it
either by a tumulus, or as the case for the royal tombs of t
tne acropolis of Mycenae, by a sort of covered passage in tne
198 neolithic fasnion. A second comprised the excavation in the
rocky side of a hill of a rectangular cell, measuring 9.8 to
16.4 ft. on a side and 6.6 to 9.8 ft. high, its upper part b
being shaped like a roof with two or four slopes or as a dome,
access to which was formed by a passage (dromos), concealed
after the burial by a mound of earth. The third composed the
sepulchre of a great chamber built with a dome beneath a nat-

natural or artificial tumulus, preceded by a vestibule, and with or without a rectangular cell at the side, accessible by a long avenue between walls, that was sometimes filled after the burial and sometimes remained open. As examples of the latter may be cited the "Treasury of Minyas at Orchomenos, the Tombs of Menidi, Dhimini and at Mycenae, those called the Tomb of Clytemnestra and that denominated the Treasury of Atreus or Tomb of Agamemnon, the most important of all.(129).

III. Construction.

Mycenaean architecture only employed stone for its protecting mass for the substructures of the dwellings of the living as a protection from the dampness of the ground, and for the entirety of the tombs, which were desired to be durable.

Its ordinary materials were earth and wood.

The former was slightly or not at all purified, then mixed with much chopped straw and moulded in squares measuring an average of 1.6 × 1.2 to 2.1 × 1.5 ft.and 0.3 to 0.5 ft. thick.

Stone was quarried in blocks with volumes varying according to the nature of the rock. When soft, as in the Troad, for example, it was cut into rather small blocks; if hard, they reduced to the minimum the labor of cutting and the loss of material by using stones of great dimensions. Many of those known to us weigh 3.3 to 4.4 tons and several are imposing m monoliths. Mycenaean quarrymen succeeded in detaching from the rock by primitive methods enormous masses; [1] the lintel of the Gate of Lions at Mycenae measures 16.4 ft. long, 8.2 wide and 3.3 thick, weighing 33.0 tons (131); that of the
199 "Treasury of Atreus" is four times as heavy, with dimensions respectively of 27.9 ft., 16.4 and 3.7 ft. (130, 8). According to the resistance of the blocks, their shape was irregular or tended toward that of a prism. Frequently only the face was dressed, and sometimes the joints also.

Note 1. Either by sinking grooves or by forcing wedges into natural crevices or drilled holes, then swelling them by wetting them.

200 Although lime was in use, Mycenaean mortar was usually mud mixed with very fine chopped straw. Terra cotta was employed for making tiles.

The Mycenaean builder consolidated a brick wall by means of a bonding of the courses by beds of mortar 0.4 to 1.2 ins. t thick and by a grillage of wooden timbers placed lengthwise and crosswise the wall a regular distances.(130, 1, 5).

Construction with small stones conformed to the same fashion.

Stone masonry termed "Cyclopean" denotes more or less skill, according to locality. Sometimes -- thus at Tiryns (130, 2)-- the material was used just as it came, the crevices being filled with small stones and earth mortar; sometimes, as on the walls of Argos (130, 3), polygonal cut stones were arranged with care and often with art, whose faces averaged 3.6 × 4.3 ft. Sometimes even -- for example at Mycenae -- (130, 4, 8), the beds were leveled without paying attention to equality of courses, to verticality of the joints, or to avoidance reentrant angles. Finally, the walls of Troy reveal the use of t the system of a mass of little stones and of mud between two faces. The covered passage of the necropolis in the Citadel of Mycenae presents a specimen of that connection of stone s slabs after the manner of carpentry, whose use we have already observed in Crete (page 188). The use of metal cramps was familiar to Mycenaean builders for joining adjacent elements, such as the abacus of a capital or a half column.(130, 10).

Note 1. So called because of a legend giving the honor of the construction of the walls of Tiryns to seven Cy lops engaged by the king Proitos.

The thickness of Mycenaean walls is considerable; at Troy it is from 11.5 to 13.1 ft.; at Mycenae from 9.8 to 23.0 ft.; at Tiryns from 23.0 to 26.3 ft.; even being 57.4 ft. in the casemate portions of the enclosing walls.(127, 1, °o. 13; 132,2)

We have already observed, that normally the elevation of t the Mycenaean walls comprised a substructure in stone, above this being a mass of bricks or small stones with anchors of wood. Their ends were composed of a wooden framework and a filling of crude bricks or of earth (130, 5, 6). The surfaces composed of these materials were protected by a facing or by wainscoting.

The doorways were trapezoidal openings, with or without jambs, covered by lintels of wood or of stone, the latter being

cut thicker at middle than ends, so as to increase their resistance to breaking, and were also relieved by corbelling. (130, 7, 8; 131). They did not fear ample proportions; the opening of the Gate of Lions at Mycenae is equivalent to an area of about 102.3 sq. ft., and that of the entrance of the "Treasury of Atreus" has one of 156.1 sq. ft. [1] Closure was accomplished by one or two leaves, measuring up to 5.2 ft. wide.

Note 1. Gate of Lions; height 10.5, width at top 9.4, at bottom 10.2 ft. Gate of Treasury of Atreus, height 17.7, width at top 8.4, at bottom 9.6 ft.

The isolated support was commonly constructed of a shaft of wood set on a stone base and fixed to it by means of tenons; but it was likewise made of stone.

202 The floor was an area of beaten earth, or of pebbles connected by lime mortar, three layers of which were applied. A drain was formed by a course of concave and oblong tiles of terra cotta set in masonry trenches.

As for the covering, the normal mode was a ceiling of carpentry resting on isolated supports, if necessary. [1] Likewise
203 the existence of a central hearth in the megaron required in the corresponding part of the roof an opening, whose construction is unknown.

Note 1. Such was the group of four columns arranged about the centre of the great megaron of the Palace of Tiryns. (182, 2, No. 8)

Yet the Mycenaean builders knew how to cover in stone the span of a gallery by the artifice of corbelling the courses,-- shown by the casemates of the fortress of Tiryns (132, 2), 6.6 ft. wide and 9.8 ft. high,-- or that of a hall forming a circle with an area of nearly 1808 sq. ft. In the second case was obtained an ellipsoidal dome with three centres (132,1) [1], by the Egyptian system applied at the tombs of Abydos,[2] by a series of rings of diminishing diameters, with the filling of the last circle by a slab, dressing off the projections after completing the construction. They further proceeded economically, limiting the cutting of the vertical joints to a narrow band next the inner surface of the block and comple-

completing the extaados by filling the voids with stones and earth.

Note 1. See page 70 and Fig. 42, 7.

Note 2. At the Treasury of Atreus there are 33 rings.

As for the roof, it was sometimes a terrace of tamped earth, sometimes a gable with two or four slopes, to which there is a reference in the Homeric poems, and that is imitated by sarcophaguses in the form of a house.

IV. The Effect.

Like its elder Cretan sister, Mycenaean architecture loved effect, and its tastes were similar to those of the former.

Its comprehension of monumental effect is manifested in the arrangement of its palaces and its tombs. With its propyleions, doubled courts and porticor, its megaron elevated by two steps and preceded by an antechamber with three doorways and a columnar vestibule, the dwelling of the sovereign of Tiryns lacked neither appearance nor character; and a truly grand conception was that of the "Treasury of Atreus" with its avenue 114.8 ft. long and 19.7 ft. wide, its great portal with an ample opening 17.7 ft. high, its preliminary corridor, its vast domed chamber built with a diameter and height of about 49.2 ft., and finally its terraced chamber at the end of the last passage. Indeed, we shall soon see, that Hellenic architecture believed it should appropriate for its own the two essential elements of the Mycenaean programme, the propyleion and the magaron, the last being a prototype of the Grecian t temple.

It indeed appears that Mycenaean architecture had a taste for the secondary effects of monumental sculpture; but it had to reckon with its insufficient tools.

The stone masonry did not admit of relief; the walls always retained a rudiment of a modeling in projection made by their stone substructure in relation to the upper surface, in the projection of the woodwork of the roof, even the relief of t the narrow belts, though indeed small (135, 1); it was relieved on the facade by the accidental monumental portals with architraves in recessed bands, engaged columns and tablets in relief -- such as that of the "Treasury of Atreus" or that of

the Lions at the entrance of the Citadel of Mycenae.(131).

The form of the Mycenaean isolted support recalls that of the Cretan column, though more slender. Cut as an inverted frustum of a cone, the shaft was sometimes smooth, sometimes grooved by numerous flutes of small depth and almost touching, (134, 3, 4), sometimes carved or with guilloches (134,2). A base was the rule, composed of one or two disks, scarcely larger than the bottom of the shaft. As for the capital, one or two slabs were superposed, generally with plain edges, sometimes decorated by disks as at the Gate of Lions, or one or m more cushions with torus, cavetto or cyma profiles, and generally enhanced by decoration in relief.(134, 1; 131).

Mycenaean architecture had a weakness for the effects of o ornamentation.

It loved those of materials, which it demanded from the coatings further necessary for the preservation of a wall of c crude bricks; from the wainscotings also useful, of native or foreign woods; from the use of certain varieties of silicious limestone presenting the appearance of breccia, prophyry and basalt; from the use of large overlays of metal, of precious substances and of enamels, indicated both by the numerous traces of fastenings observed on the walls, and the evidence, though with the suspected truth of poetic exaggeration, of the Homeric poems celebrating the splendor of the Palace of Menelaus at Sparta, all illumined by the gleam of bronze, silver, gold, iron and amber, and that of the dwelling of Alcinous with its walls overlaid by bronze, its doors and columns plated with silver and gold.

To that passion for brilliancy among Mycenaean artists responded the love of color. They utilized the green or dark r red tints of certain of their materials; they coated the walls with white, blue, ochre and reddish brown' they executed thereon frescos, of which some fragments have remained to us; t they inlaid in them pastes of blue glass; finally, they hung them with those many colored fabrics, whose manufacture formed the chief occupation of noble ladies of that time, according to a reference to the Homeric poems.

On the contrary, doubtless because of the insufficient tools,

sculpture was little employed; the works of engraving or guilloches were found more practical, a finished specimen of these overlaid works being presented to us by the great Tomb of Orchomenos.(133).

The ornamental repertory of Mycenaean architecture was in large measure common to it and to Crete, but on the other hand, it manifested oriental influences. It is characterized by an absolute preponderance of the geometrical style and by a method of composition with a prolonged repetition of the same element. The preferred motives were the discus, the ornament in the form of two opposed and reversed exclamation marks, that we have already found in Crete (pame 191), an arrangement likewise a favorite in Cretan art -- of two palmations diverging from each side of a vertical band (135, 1, 2), and particularly guilloches, frets, spirals isolated or variously joined, rosettes, volutes, a row of squares forming a band, and chevrons.(135).

The floral decoration was reduced to lanceolate leaves, very much conventionalized, which they loved to form as a sort of collar at the bottom of the capitals (134, 2, 3). As examples of motives inspired by the sight of the human or animal reality may be cited the lions of the gate of Mycenae, conceived in oriental taste (131), and a fragment of fresco from Tiryns, that represents an episode of the combat of bulls.

Second Part, Second Epoch of Egean Architecture.

When after "lying fallow" for three centuries, the Egean region had realized the conditions for a renaissance of the art of building, this was simultaneously accomplished in the western part of Asia Minor -- in Phrygia, Lydia, Caria, Lycia, a and in Etruria in central Italy.

From the possession of iron tools resulted for these schools an immense increase in their constructive abilities.

Section First. Prehellenic Egean Architecture.

Chapter 1. Prehellenic Architecture of Western Asia Minor.

I. Monumental Topography and Chronology. -- Human and Natural Conditions. -- Influences.

PHRYGIA. -- Toward the end of the 9 th century the Phrygians, who had immigrated from Thrace two or three centuries earlier, formed a great state, that reached its climax under Tantalus and Midas, the former of legendary memory, and the latter contemporaneous with the end of the 8 th century. Their proper domain was the plateau west of the Halys, from the Black Sea and Sea of Marmora as far as the bordering mountains at the south. On the west they occupied the elevated valleys of the tributaries of the Egean Sea, and they appeared to have reached the northern shores of the coast of the latter. Very roughly treated by the invasion of the Cimmerians about the middle of the 7 th century, they were conquered by the Lydians in the first half of the 6 th century.

Prosperous and well endowed, the Phrygians made architectural productions, that three groups of ruins, which may be dated from the last third of the 7 th century and the first half of the 6 th, permit us to appreciate.

A first one is situated in the region of Sangarios and comprises rare vestiges of the Phrygian capital Gordion, and on the route from Kutayeh to Kara-Hissar are remains of fortresses, of open air sanctuaries with altars and necropolises; at the places called Ayazin, Yapouldak, Delikli-Tach, Bekchich, Pichmich-Kale, Koumbet, Doghanlou-deresi or Iasili-Kaia etc., may be seen monuments cut in the rock, sanctuaries or tombs, one of them being marked by an inscription commemorating king "Midas".

A second group is in Paphlagonia in the low valley of the Halys and at t west of that river at Iskelib and at Hambarkia, and exhibits tombs.

Northeast from Smyrna in the mountainous region of the Sipyle exist the remains of a city with a fortified acropolis, a sanctuary and a colossal idol cut in the rock, finally with tombs, the principal one passing as that of Tantalus.

LYDIA. -- Lydia had for its native land the valleys of the Hermos and the Caistre with Sardès (now Sart) as its capital. Under the dynasty of the Mermnades, who assumed the p power in 687, it rapidly increased in prosperity and in power, about the middle of the 6 th century, so as to impose its dominion or protectorate upon the entire western half of Asia Minor. Favored by nature, which had gratified them by a very fertile soil and the best route for communication between Mesopotamia and the Egean Sea, the Lydians accumulated so much wealth and lived in such luxury, that the name of their last king Croesus (561-546) has become a synonym for wealth and splendor. But in 546 at its climax, the Lydian empire was o overthrown by the rude hand of Cyrus.

Of its brilliant civilization, that dazzled the Egean world, great memories remain, but few vestiges; at Belevi on the route from Ephesus to Sardes is a great tomb beneath a tumulus; there is particularly at 7 1/2 miles north of Sardes and near Lake Coloe is a necropolis, which is dominated in height by the Tomb of Alyattes, the father of Croesus, who died in 561.

CARIA. -- In possession of the fertile valley of the Meander and of the well indented coast extending between Samos and Rhodes, finely located at the southwest angle of Asia Minor to radiate at pleasure toward Greece, Crete, Cyprus, Syria and Egypt, the Carians early devoted themselves to navigation, for whose invention tradition gives them the honor, and after the decline of Cretan power, they dominated the Archipelago for a time; they voluntarily hired their courage to the Pharaohs.

A rather crude architecture furnished them with tombs, specimens of which are preserved by the peninsula of Halicarnassus, and with remarkable fortifications, recalled by the "Wall

of the Leleges", north of Iassos.

LYCIA. -- Isolated within its wooded mountains, whose m mass extends on the southern coast of Asia Minor between the gulfs of Makri and Adalia, Lycia possessed a very original civilization at an early date: The Lycians understood how to erect fortifications, as shown by those of the position of P Pydnai at the east of Xanthos, to excavate and to cut stone; finally to construct in carpentry buildings, whose faitnful and detailed image has been preserved to us by numerous stone tombs at Phellos, Antiphellos, Myra, Pinara, Hoiran, Xanthos, and at Gjiolbaschi-Trysa.

The Egean civilizations of Asia Minor were all permeated by oriental elements of Egyptian, Syrian and Mesopotamian origin. They were received both by land and sea; by contagion, so to speak, because of the vicinity of the Hittites and the Assyrians -- the former having been established in Cilicia from the middle of the 9 th century; by importation by the great commercial current, that through Carchemis, Pteria, Sardes and Miletus, carried to the Egean Sea the products of Mesopotamian industry, as well as by means of Phoenician or Ionian navigators -- the latter being familiar from the middle of the 7 th century with the ports of the delta of the Nile; it is finally necessary to take into account the frequent communications caused by political relations of Lydian princes with Assyrian and Saite sovereigns, and the regular connection of Caria with Egypt. Dependance is indicated, particularly by the Syrian tendency of the orgiastic rites practised by these races and by a marked taste of their decorators for motives dear to Egypt, Mesopotamia and Phoenicia.

Yet these peoples, those of the coast in particular, possessed proper temperaments and submitted to special physical servitudes. The cooperation of both with oriental influences c constituted the dominating character of the architectural styles of Asia Minor in the second Egean period.

II. The Programmes and their Realization.

The better known portion of their work is that with a funerary purpose. According to whether they operated in mountain regions or in the lowlands, they preferred to cut a tomb in

the rock or to construct it.

In the first case, which was common in Lydia and normal in Paphlagonia and Lycia, the monument was composed of a facade in the image of the facade of a house or a temple -- this was sometimes a blind screen and sometimes a portico -- and a cell, access to which was sometimes arranged by a flue terminating at the summit of the rock.(143, 4, 5, 6, 7).

Where the nature of the ground was opposed to the use of t the rock-cut system, is found a remarkable survival of the f forms of the neolithic age.

That the "cist"is represented in Caria by rectangular coffers in stone or terra cotta with average dimensions of 1.5 × 1.0 ft., composed of four vertical slabs and of a fifth horizontal one, forming a covering.(138, 6).

That of the dolmen beneath a tumulus appeared in the region of the Sipyle, where the Tomb of Tantalus presents a remarkable example in the form of a sepulchral chamber 7.1 ft. wide and 9.35 ft. high, occupying the centre of a conical mound of stones.(138, 1; 142, 3; 143, 1).

As for the type of the covered passage, it appears to have obtained favor in Lydia and Caria. Under an artificial tumulus, a corridor 13 to 16 ft. long and 3.3 to 6.6 ft. wide led to a rectangular cavity, whose sides averaged from 6.6 to 16 ft. and its height 9.8 ft.; its situation in the mound is central in Caria but excentric in Lydia, which permitted the carrying on in front of the work of construction and of terracing.(138, 2, 3). The tumulus was surmounted by one or more terminals imitating the phallus, a symbol of life.(143, 1). In Caria the monument sometimes occupies the middle of a circular enclosure marked by a parapet. The principal specimens of the kind are the Tomb of Alyattes near Sardes and the nameless Tomb at Belevi near Ephesus.(138, 2, 4; 142, 1, 4).

Finally, exceptionally in the region of Sipyle, frequently in Caria and commonly in Lydia, is found the tomb in the form of a small structure. In the two former regions, it consists of a rectangular chamber, in part sunk in the earth or excavated in the rock, bounded by two parapets, covered by slabs and sometimes surmounted by a monument, or again of a cell in

the mass of the rock cut into the form of a building (138, 7; 143, 8); in Lycia, the dwelling of the dead is an exact copy of the house of the living.(140, 1; 141; 143, 9).

A fortification of the type found in Caria and Lydia comprised a wall 3.3 to 9.8 ft. thick flanked by towers with battlements. The normal plan of these is rectangular; yet the "Wall of the Leleges" near Iassos was furnished with semicircular bastions.

In Phrygia were cut in the rock on "high places"altars composed of a platform in several steps leading to an area crowned by a stele or a niche.(139). A rectangular cavity formed in the slope of the rock at the centre of a front imitating a facade served as a tabernacle.(137).

III. Construction.

To the architecture of the Lydian age, Asia Minor offered resources in woods -- oak, pine and cedar -- that it refuses more and more to modern times. Hence construction in carpentry prevailed in the elevated regions, in Phrygia and Lycia; elsewhere its sway was divided with that employing earth, moulded in squares or not so.

Thanks to the tombs, as we have stated, the construction of the Lycian house is perfectly known to us.(140, 1; 141; 143,9). Two similar horizontal frames, each composed of four timbers framed together in a rectangle, one placed on the ground to form the substructure and the other being supported above the former by four posts connecting the corresponding angles, composed a skeleton whose spaces were closed by means of a filling of tamped earth, crude bricks, or of wood.

The little structure owed a very original appearance to the numerous projections of its framework and to the curved angles of some of these. The former resulted from two practices of Lycian carpentry, which on the one hand employed joining by halving, allowing the ends of the crossed timbers to project much beyond the junction (140, 1), and on the other by the lack of large timbers was forced to use doubled timbers, connecting them by means of a sort of cramps at proper distances.(140, 3, 4, 5). As for the curvature previously mentioned, it was required by a defect common to the trees of that

country, that starting on the steep slopes could only take a vertical direction after having grown perpendicular to the ground.(140, 2).

Less forested but richer in clay, Phrygia and Lydia preferred earth, that they sometimes employed for clay plastering on reeds, sometimes to erect on stone substructures with mud mortar walls of crude bricks -- like the Temple of Gordion, that was further furnished with facings of terra cotta -- sometimes of burned bricks -- as proved by the Royal Palace of Sardes.

As for stone construction, thanks to the possession of iron tools, it could produce better and to a better purpose than that of a preceding age. Indeed it was pleased by and understood stonecutting; knowing how to sculpture in the rock the whole or a part of a small structure and to impose regular forms upon its materials; more and more for the construction of the isolated support was stone substituted for wood.

215 If polygonal masonry remained in favor, it was no longer as formerly, a great pile of rough blocks, but a careful assemblage of well fitted blocks. Better still, there was a marked tendency to level the beds, even when the masonry was polygonal (140, 8); to fashion rectangular ashlars and the regulation of the courses.(140, 9; 142, 1, 2). Construction was usually executed with dry joints and without clamps. [1] The desire for and the method of solid construction are revealed by the system frequently observed, of doubling the walls and the ingenious arrangement of the Tumulus of Tantalus, divided by a series of internal walls, one of which is circular and the others radiate from the centre.(140, 7).

Note 1. Yet the builder of the Tomb of Alyattes employed clamps of lead made in dovetail form.

The openings have jambs generally inclining toward each other and usually have a lintel as a covering; yet the facades of tombs teach us that Phrygia likewise practised the system of the arch, turned on stilted centres.(143; 5, 7).

216 For modest structures, thatch or bundles of reeds supplied the elements of the covering. If this were of wood, its most common arrangement was that of a ceiling of timbers and trunks

projecting much beyond the surface of the wall and bordered by a parapet to retain the earth piled on its surface.(140, 1; 142, 8). At other times, it was a roof in two slopes, whose ridge -- as we know from the representations shown by the rock-cut facades of Phrygia -- rested on supports set at the apexes of the gable walls, and at intervals by the timbers of the ceiling or on the ground itself.(137; 142, 5, 7; 143, 2, 4, 6). In Lycia was frequently employed the form of a reversed keel constructed in the shape of the bow of a vessel.(142 6; 143, 9). It was sometimes visible, sometimes masked by a ceiling.

Yet the Egean architectural styles of Asia Minor knew how to cover an interior in stone. They employed either the system of the ceiling of slabs set beside each other, of which numerous examples are shown by the Lydian and Carian tombs; (142, 1); or that of a pile of panels successively smaller, an example of which is presented by the Tomb of Belevi (142, 2); or again that of the false tunnel vault with pointed or semicircular section, obtained by setting corbelled courses, and which was chosen for the Tomb of Tantalus and for many L Lydian and Carian sepulchres.(142, 3). On occasion was constructed a radial tunnel vault, indeed quite roughly realized in small stones, for example, that covering the corridor of the Tomb of Alyattes.(142, 4).

IV. The Effect.

Anxious for effect, the Egean architectural styles of Asia Minor sometimes sought that produced by material greatness, as by the proportions of the Tumuluses of Tantalus and of Al-- yattes, the first measuring 110.3 ft. diameter and 82.0 to 8 88.5 ft. high, those of the second being respectively 1106.5 and 226.5 ft. The idea and a certain sense of monumental composition are recognized in the form of these masses, whose c cone surmounts a constructed base, sometimes defined, as at the Tomb of Tantalus, by rudiments of a plinth and a cornice; (143, 1); likewise the elevation of the rock-cut facade is t the sketch of a type of facade, whose formula was reserved to be perfected by the Greeks. (143, 2, 4, 5, 6). Even the effects of a harmonic order were not unknown, as proved by the

arrangement of the proportions of the Tomb of Tantalus, in w whose outline may be exactly inscribed an equilateral triangle.

As for the picturesque, it is intended and obtained in the Lycian structures, which emphasize the manifestation of their framework and by the rock-cut facades of Phrygia and Paphlagonia.

For the effects of secondary sculpture, the architects of Asia Minor sought them less than those more easily obtained by drawing, engraving and color. The excavations at Gordion have revealed that in Phrygia were essentially required facings of terra cotta tiles, modeled and painted.(137; 143, 2). The relief is wanting or is barely sketched, as the case on the Tomb of Tantalus.

The types of the isolated support peculiar to the Egean architectural styles of Asia Minor exhibit both an incontestable care for the form of this member and evident borrowings from the decorative treasures of the ancient East.

The column fashioned in Phrygia and Paphlagonia -- stumpy, quite conical, with broad footing in the strong projection of a very thick torus, recalls Assyria (144, 3, 4); the same for such a capital to be seen in a tomb at Kaumbet (144, 1), while Egypt is recalled by another from the necropolis of Ayazin (144, 5) and the head of a column from Iskelib (144, 8), carved in the image of the front of a couching lion, a theme elsewhere used by the Persia of the Achemenides. A capital from Yapouldak and another from Ayazin (144, 6, 7) exhibit volutes allied with the East on the one hand, and on the other with Greece. At Ayazin, at Hambarkaia (144, 2, 4), are seen others related to the family of which the Grecian Doric is the head.

Likewise strong oriental influences are betrayed by the elements of the ornamentation of the prehellenic monuments of Asia Minor. These are palm leaves and lotus buds, rosettes and volutes (145). Phrygia liked the fret, chess-board, sawtooth, zigzag and also some scrolls (145, 12; 140,6), that recall one of the most typical elements of the capital of Persia of the Achamenides.

Yet tthere is no peculiarity of these schools more indicat-

indicative of their relationship to the ancient East, than t
220 their taste for animals, couching, facing, passing or fight-
ing, bulls, griffins and especially lions -- dear to Mesopot-
amia -- and the winged sphere, so characteristic of the arts
of western Asia.

Chapter 2. Etruscan Architecture.

In general the area of Etruscan civilization had as its centre a strip of the territory of central Italy extending from north to south on the right bank of the Tiber, and which contains two groups of cities:-- in the south, Tarquinii near C Corneto, Blera (Bieda), Norchia, Caere (Cervetri) with its p port of Pyrgi, Falerii, Volsinii (Velsono), Vulci; in the north, Clusium (Chiusi) Perusia, Cortona and Arretium (Arezzo). It further comprises all the Tuscan province, ruled by the cities of Ansedonia, Vetulonia, Rusellae, Populonia, Volterra, Fesulae (Fiesole near Florence), Luna, and beyond the dorsal ridme of the peninsula,the basin of Reno and the shores of t the mouth of the Po, controlled by Felsina (Bologna), and in the vicinity at a distance of 4.35 miles on the border of the Reno, at the place now called Marzobotto, by a recently discovered city, whose name is unknown. It finally extended south of the Tiber over Latium -- adding Alatrium -- (Alatri), Alba Fucentia on the north of Lake Fucino, Rome, which was e entirely Etruscan in respect to civilization until the 3 rd century B. C., and at last during a certain time, into Campania controlled by Capua.

Between 800 and 400 occurred the brilliant period of the p political history of Etruria.

Harassed on the north by the Gauls, on the east by the Sabines, at the south by the Samnites and the Greeks, the Etruscan empire was gradually reduced to its native country. After 376 it suffered the incessant attacks of the Romans, and it was subjected at about the end of the 3 rd century.

But the ruin of the power of Etruria was survived by not o only its prosperity, but also its individuality, and it was not before the Christian era, that the latter was absorbed i into the unity of imperial Italy. Thus the duration of Etruscan architecture is computed at seven to eight centuries.

I. Human and Natural Conditions. -- Monumental Topography and Chronology. -- Origins and Radiation.

Etruria early developed an urban and industrious life. Enriched by the fertility of its soil and by the very great activity of its external commerce, more or less doubled by pir-

piracy, it permitted its princes and its aristocracy to satis-fy luxurious tastes, attested by the paintings executed on t the walls of tombs, as well as by the number and the splendor of the objects of art and ornamentation spared by time. On the other hand, it had a sentiment for order and organization as well as a need of defense, which should produce the existence of civil and military engineering.

In fact, if there exists no ruin of a palace or an important house, at least the excavation of quarters at Vetulonia a and of an entire city at the place called Marzobotto near Bologna, the Cloaca Maxima (great sewer) of Rome, a work of the middle of the 6 th century, reveal thatprogrammes of city works were proposed to Etruscan architects. Without mentioning the famous Bridge of Sublicius at Rome, whose two constructions, one preceding and the other succeeding the attack of Porsenna, were their work; there still exist bridges like that of Blera (Bieda) and of the channel of Marta near Bulicane, west of Viterbo; paved roads with gutters; channels under tunnels like that of the stream of Veii called Ponte Sodo, and particularly the discharge tunnel of Lake Albano, executed by them for Rome at about the end of the 5 th century, indicate the habit of public works. Finally, the existence of an important demand for fortifications is attested by considerable remains of walls at Alatrium, Alba Fucentia, Ansedonia, Arretum, Cortona, Fesulae, Falerii, Perusia (Gate Marzia), Rome (Wall of Servius Tullius) and at Volterrae (parts of the enclosing walls and city gates) etc.

There remains little of the Etruscan temples. Their list is quickly drawn up:-- five at Marzobotto, four at Alba Fucentia; two at Rome; that of the Great Mother and that of Capitoline Jupiter, the principal sanctuary of the city; [1] others at Alatri, Cervetri, Conca, Falerii, Florence, Vulsinii etc. Yet the eminently formalist character of the religion of the Etruscans and the intensity of their superstitious devotion must be the causes of a multiplication of the demands for religious edifices, as much as the relative fragility of their construction. [2]

Note 1. The Temple of Capitoline Jupiter, whose foundations have been discovered in the gardens of Palace Caffarelli,

is known by a description by Denys of Halicarnassus and by t the represented monument. Commenced by Tarquin the Elder and finished by Tarquin the Proud, consecrated in 509, a first edifice was burned in 83 B. C.; a second was rebuilt on the same plan and was again destroyed by fire in 69 A. D.; a third was rebuilt by Vespasian and suffered the same fate; a fourth was the work of Domitian.

Note 2. Compare the numerous burnings of the Temple of Capitoline Jupiter at Rome.

Likewise for funerary architecture; Etruscan civilization proposed an ample requirement for it in adopting the belief
223 in a survival of the dead in the tomb, with needs analagous to those of the living, which produced the necessity of substantial and comfortable sepulchres, even luxurious, if one may so speak.

In fact, by hundreds or even thousands does one meet with groups of them in necropolises, frequently monumental, in the vicinity of Viterbo, Val d'Asso, Norchia, Bieda, at the gates of Cervetri, near Corneto, at Perugia (Tomb of the Velumna or Volumni), Orvieto, Volterra, Cecina, Chiusi (Tumulus of Poggio Gajella), Cortone (Tumulus called Melone), Albano (Tomb of Aruns), etc.

To the importance of the demand corresponded the abundance and qualities of the resources, that Etruria placed at the commend of the constructor. He utilized resinous trees, celebrated in antiquity for their height and straight trunks (Strabo); excellent clay; stone in abundance -- in the north being a very fine-grained sandstone of a grayish blue or yellow,
227 one hard and the other relatively soft; in the south were ordinary limestone (travertine) and rocks easily quarried (tufa called peperino); marble (Carrara) and alabaster. Finally the island of Elba supplied iron and copper.

Let us add that this combination of propitious conditions was perfected by the aptitudes of an industrious race, well endowed in respect to feeling and artistic powers.

But what was this race?

The Grecian legend recorded by Herodotus and by Strabo placed its native land in Lydia, whence it had swarmed under the

lead of Tyrrhenos, a son of Atys; hence the name of Tyrrhenians given to the Etruscans by the Greeks. The researches of modern science resulted in the hypothesis of the confluence of two migrations into Etruria, of which that of the Rasennes was most important in numbers and came by land from beyond t the Alps, the other being superior in regard to civilization and originating in Phrygian or Ionian Asia Minor.

What appears certain -- confirmed by the peculiarities of their language, customs and religion -- is that the civilization of the Etruscans was for centuries fundamentally different from that of the Greeks, and that in many respects they recall those of western Asia. [1] It is also a fact, that their decorative repertory indicates numerous original borrowings of Egypto-Mesopotamian, common to Phoenicia, Lydia and Phrygia; that they shared with the peoples of the two last countries a marked preference for burial beneath a tumulus and a t tomb excavated in the slope of a rock with a facade; finally that the current use of the vault draws their school of architecture towards the oriental, as well as distinguishes it f from the Hellenic.

Note 1. Thus the Etrurian costume was mostly Asiatic, with a long robe sprinkled with flowers and a polychrome border, sometimes in the Lydian fashion and with a hood analagous to the Phrygian cap; that alone of all the Mediterranean peoples, the Etrurians were addicted to the essentially oriental practice of divination.

Yet the continuous commercial relations maintained by the Etruscans, if not with the Hellenes of Italy and of Sicily, their detested rivals, but at least with those of Greece and of Ionia, exposed them to an influence from Grecian art, very energetic and effective from about the beginning of the 2 nd century B. C. [2]

Note 2. Compare the active importations into Etruria of p painted Greek vases, of which the Etrurian necropolises have yielded so many specimens contemporary with the 6 th century.

224- *In brief, compared to that of Greece, the architectural works of Etruria exhibit a parallel use of an original common basis, but with less genius.*

In its turn, Etruscan architecture formed a school. From it the Romans derived some of the essential elements of their art of building, among these from which modern construction has most profited.

II. The Programmes and their Realization.

The Etruscan conception of the city comprises a systematic arrangement on a regular plan. A division into four quarters resulted from the intersection of two avenues, one extending from north to south (cardo) and the other from east to west (decumanus), while these portions bear traces of a network of streets parallel to the former.

The greater streets of the excavated city of Marzobotto had a width of 49.2 ft., equally divided between a road and two sidewalks. The paving was generally carefully constructed w with slabs; at certain distances the road for wagons was crossed by a series of high blocks, in case of rain permitting passage dry-shod from one sidewalk to the other.

Cities were ensured perfect drainage by a system of channels and sewers; as an example of their installation may be cited the Colaca Makima of Rome, executed to drain the Forum, and whose width is from 9.8 to 12.8 ft.

Etrurian fortification opposed to the enemy strong crenelated walls of stone, frequently strengthened by buttresses and sometimes flanked by towers; it also comprised ditches -- such as that at Rome outside the wall of Servius Tullius; gateways with internal vestibules in Asiatic fashion similar to the Gate del Arco of Volterra, and which sometimes -- as the case of the Gate of Augustus at Perugia (147) -- opened between two towers.

According to their condition, the Etruscans inhabited simple cabins, either circular or oblong, or comfortable houses with plans known to us by a description of Vitruvius and by their images presented by tombs and cinerary urns.(148; 149, 3, 4). It formed a rectangle with its centre occupied by a little court (atrium), with a basin at its centre designed to receive the water discharged from the internal slopes of the roof. On it terminated a vestibule, lighted from it, opposed to which was a living room (tablinum) with chambers (cubicula)

at tne sides. An urn discovered near Cecina appears to indicate that the elevation of the Etruscan house comprised a story with external gallery under the projection of the roof. (148, 2). The elevation of the dwelling on a high base protected it from the dampness of the ground.

Without mentioning a modest type -- further suited to a period when cremation was the custom -- which consisted in excavation more or less carefully walled with masonry, Etruscan tombs are divided into three categories.

A first is adapted to this undulating country rich in soft
228 stone, and comprises artificial grottos with or without passages for access, such as are seen in the Val d'Arno, at Norchia, and subterranean rooms accessible by a stairway, as examples of which may be cited two beautiful tombs at Cervetri, and particularly the Tomb of the Velumna at Perugia.(149, 3, 4). When insufficient consistency of the ground prevented t the convenient method of excavation, there was practised construction with vaulted covering in the mode of that revealed by the Tomb of Pythagoras near Cortona (149, 5), that of the Grand Duke near Chiusi, and that called Tomb of San Manno near Perugia.

A second group is formed by sepulchres excavated or built beneath a tumulus enclosed by a low wall and crowned by an emblem. The best known examples are the Tomb of Regulini Galassi at Cervetri etc.(149, 1, 2).

A third category, numerous specimens of which are shown by the necropolis of the Val d' Arno, is characterized by the s sculpture of the rock into the form of a monument, in the base of which is excavated a low cell with a narrow entrance. (149, 7).

Rarely were the tombs constructed under the open sky, like the small structures of the necropolis of Orvieto, and the s so-called Tomb of Aruns at Albano.(149, 6).

The house of the dead imitated as much as possible that of the living. The chambers were generally rectangular, sometimes circular or elliptical; when they were large, their ceiling was supported by a central pillar or by a number of isolated supports. Their walls were hollowed in niches with ben-

benches for depositing the bodies or urns. Some were extensive and were arranged on a regular plan.(149, 3; 153, 1, 2).

If on account of the insufficient data furnished by the text of Vitruvius and by the ruins leveled to the foundations,
229 the arrangement of the Etruscan temple remains uncertain in its details, its entirety may easily be eestored.(151; 154). Its plan formed a rectangle nearly square. (According to Vitruvius the length exceeds the width by one sixth). Orientated frsm south to north, according to the dogma locating in the north the dwelling of the gods, it was divided in length into two nearly equal parts; the front one formed a portico on columns; the rear was enclosed by walls and composed a sanctuary, generally triple, because of the Etruscan conception of a trinity, whose members were Tina, Cupra and Minerva, corresponding to Zeus, Hera and Athena. Sometimes the portico was confined to the front of the group of chapels, and sometimes it was prolonged by a row of columns along the sides; in the second case the rear wall extended to the line of the supports and was returned in the form of an ante.

Certain ruins -- thus those of the Temple at Marzabotto, of that at Florence, and of that dedicated by Rome to the Great Mother -- reveal the existence behind the sanctuary of an oblong room perpendicular to the main axis, to which may be attributed the purpose of either a sacristy or of a stairway.

The area of the temple was always elevated by a base from 1.3 to 3.8 ft. high with vertical sides and accessible by a flight of steps at the middle of the facade.(154).

III. The Etruscans were careful and skilful builders. Excellent metal-workers, [1] superior potters capable of producing perfect tiles with a thickness not exceeding 1.8 in. for a length of 3.8 ft. and a width of 2.8 ft., they were also excellent carpenters, [2] and further good stonecutters, ab-
230 le to quarry blocks of large dimensions with lengths of 6.6 to 13.5 ft.; [3] to accurately shape the voussoir of an arch, to cut a plane surface and to make a carving.

Note 1. Etruscan bronzes were famous, even at Athens.

Note 2. Proved by the success of undertakings as considerable for that period as the excavation of certain tombs and

the boring of the tunnel of Ponte Sodo (230 ft. long, 11.5 to 13.1 ft. wide and 19.7 ft. high) and the emissary of Lake Albano (39.4 ft. long, 5.4 ft. wide and 6.6 to 9.8 ft. high.

Note 3. The walls of Arretinum contained blocks 6.6 to 8.0 ft. long; certain stones in the walls of Volterra measure 10.5 ft.; the enclosing walls of Cortona show some that attain a length of 9.0 to 13.1 ft.

Even when monumental, a large part of Etruscan building was of wood, and when it was merely domestic, it was almost exclusively limited to that material. It took only two precautions against injuries by dampness of the earth and the rain; between the edifice and the ground was interposed a stone base, and the carpentry was sheltered under terra cotta coverings.

It again made free use of crude bricks.

The difference of conditions presented to the stonecutter in northern Etruria, provided with quite hard sandstone and travertine, and to that in southren, supplied with soft stones (tufa and peperino), was the cause that the masonry was n not the same in the two regions. In the former the desire for economizing labor determined a preference for great masses a and for their use with the natural polygonal shape produced in quarrying them. The cutting was sometimes rough, and on the contrary sometimes careful, and the setting tended to leveling the courses. Southern Etruria reduced the dimensions of the materials and imposed regularity of jointing; or indeed -- as shown by the walls of Caere and the substructure of the Temple of Capitoline Jupiter at Rome -- all the stones
231 232 were of the same dimensions, or even -- as proved by the wall of the Tabularium at Rome -- there was an alternation from o one course to another, of blocks set lengthwise and others placed across the wall.(152, 5).

The custom of Etruscan construction in perfecting the continuity of a surface by means of pieces carefully fitted in t the crevices manifested both its conscientiousness and its care for economy.(152, 3). It is again a mark of attention and of foresight in its care to arrange in the walls at regular distances, vertical slots to ensure their drainage.(152,2).

Etruscan masonry did not comprise mortar; it was not before the end of the 4 th century and in foundations that occurred a jointing in lime mortar. Where the material was soft, the use of iron cramps was normal.(152, 7).

The buttress was in current use, sometimes on the exterior, sometimes on the interion, on parts of the same wall.

To cover openings, the Etruscans not only employed the methods of the lintel, of the arch formed by corbelling the courses, and also that of the radial arch; prived by the gates of Ferentinum, of Volterra, the Gate of Augustus and the Gate Marzia at Perugia, the two latter being defined by a series of 29 voussoirs.(147).

Etruscan architecture made great use of the isolated support, which it made of wood, and also of stone.

As for the covering, at the same time as various sorts of ceilings, it currently and readily employed the system of the vault.

By indications of Vitruvius confirmed by representations observed on various monuments, we know that a temple was enclosed in the following manner.(153, 4; 154). On the columns of the portico and on the longitudinal walls of the sanctuary w were placed pairs of timbers (trabes compactiles). On these were laid a second transverse series by means of beams (mutuli) projecting from the place of the facade a distance of one fourth the height of the columns.

Many Etruscan tombs teach us, that the houses, of which they were faithful images, were covered by a pile of frames, g gradually becoming smaller.(153, 2).

As for the vault, Etruria presents specimens of all known tunnel vaults; from that produced by corbelling the courses
233 with or without cutting off the projecting angles, even to t the jointed straight arch, of which the emissary of Lake Albano and the Mamertine Prison in Rome exhibit remarkable examples.(153, 11), in passing by the systems of corbelling with a key (153, 3, 5) and of voussoirs with or without radial beds.(153, 6 - 9). The duration of these works, some of which are more than 25 centuries old, forms a decisive proof of the mastery of Etruscan constructors.

Note 1. As ancient examples of the latter may be cited the covering of the Tomb of Pythagoras at Cortona (153, 6), those of the Cloaca Maxima at Rome, of the Tomb of the Grand Duke near Chiusi, of the Temple of San Manno near Perugia (153, 9, 10), of a bridge at Bieda (153, 8). The rise measures respectively 9.7, 12.8, 10.6, 13.1 and 24.3 ft.

They likewise understood how to construct solid and impermeable roofs. Against a ridge timber (columen) on the one hand, and on the other on plates set at the longer sides of the ceiling framework were set rafters (cantharii) in pairs, which extended beyond the face of the wall and the colonnade as much as the ceiling timbers projected from the facades. If necessary the points of support were increased by means of i intermediate timbers or purlins (trabiculae) parallel to the ridge. The inclination was relatively steep.(148, 2, 3; 154).

Sometimes directly, as attested by the sculpture in steps of the ceilings of certain tombs, sometimes by an intermediate layer of planks (templa), this roof bears a covering of e excellent flat tiles with raised edges and cover tiles on the joints.(157, 10).

234 IV. The Effect.

Etruscan monuments indicate a truly architectural conception of the effect.

It scarcely comprises the impression of material greatness. If some tumuluses are enormous -- like that called Cucumella at Vulci -- the known temples only cover restricted areas -- from 1076 to 4306 sq. ft. -- and not more than 32,293 sq. ft. were occupied by the giant of the family, the Sanctuary of Capitoline Jupiter at Rome. [1]

Note 1. These are some dimensions.

Foundations of Temple of Capitoline Jupiter, 189 by 172 ft.

Temple of Florence, 60.5 by 65.6 ft.

Temple C at Marzabotto, 78.8 by 62.3 ft.

Great Temple of Alba Fucentia, 72.8 by 42.9 ft.

Temple of Alatri, 48.5 by 26.2 ft.

That on the contrary, it considered the picturesque monumental is indicated by its mode of elevating on a base a tumulus as well as a house or a temple, the arrangement of a vast ex-

external portico to distinguish the latter, the very decorative composition of the gates of Perugia, by such an original arrangement of the Tomb of Aruns, etc. (148, 2, 3; 149, 1, 6; 154).

It is a fact, that secondary monumental relief secured more attention from Etruscan art, than any other of prehellenic a antiquity. It sought effects in masonry, such as sunken joints and chiseled drafts around rusticated bosses projecting more or less, as for example as shown by the walls of Fiesole, Viterbo, Bridge of Blera, and emissary of Lake Albano.(152, 4; 153, 11).[2]

Note 2. Compare the taste of the architecture of western Asia for this practice (walls of Temple of Solomon (109), walls of Cnidos). (194, 8).

It did not fail to define a surface by the projection of a plinth at the base and a cornice at the top. it freely modeled the mouldings, which do not lack accent and character, though a little rude and awkward.[3]

Note 3. Certain of these recall in a striking manner Phoenician profiles. (110, 6, 7).

It readily enhanced the surfaces of walls with separate bases and caps, or -- like the gates of Perugia (147) -- multi-
233 plied them so as to imitate a gallery; it loved to enclose t the gates by a wrought band, adorned by ears at the upper angles (157, 1), etc., and it marked the springing of an arch by a projecting moulding and its face by an archivolt.(147).

The upper parts were treated in the same spirit. A crenelated cresting extended along the ridge of the temple and on the inclined sides of the pediment, which are further accented by the pointing of the acroterias at the vertex and the angles; the lower edges of the slopes of the roof further bristled with as many rows of cover tiles (157, 10), and sometimes, as indicated by a cinerary urn (148, 2), carved in scallops by the projection of the tiles or of plates of metal. T The mode of extending the rafters above the ridge shown by E many representations of Etruscan houses recalls a practice d dear to Phrygian architecture, and we have previously noted it.(137; 143, 2, 3).

236 On the isolated support Etruscan architecture imposed the form of a pier or a column.

In the first case, it was sometimes crowned by a capital, sometimes furnished with base and capital, or sometimes without either; its faces were generallyfluted (156, 7, 10), occasionally ornamented by an arrangement of concentric rectangles open at the base, examples of which are presented by Egyptian decoration (156, 3).

As for the shape of the column, the art of Etruria at first drew from the same sources as those of Phrygia, Lydia, Ionia and Greece; later and without losing its individuality, it w was in good measure inspired by Hellenic types, whose images were represented by the paintings on Grecian vases.(156, 7, 12).

Note 1. For example, on a vase of the 6 th century found in a tomb at Chiusi -- the "Francois vase" -- see the careful representation of edifices in the primitive Doric style.

The Etruscan column was always provided with a base, that above a circular or square plinth formed a broad wavy footing, either a sort of inverted bell or a series of disks moulded as toruses or coves. The shaft was sometimes made smooth and sometimes fluted, appears to have been quite slender, as occurs when the material is wood. It was occasionally frankly conical and often swelled like a baluster.(156, 1, 6, 12).

As for the capital, the monuments have revealed three varieties corresponding to those termed Doric, Ionic and Corinthian in the architectural works of Greece. The first is called Tuscan and is composed of a slab and a cushion joined to the trunk by a cove and torus, or by a series of flat or convex rings.(156, 1). The second was composed of a pair of divergent volutes, sometimes doubled vertically, generally more or less vertical and rarely inclined; between them was sculptured a palmatium in oriental taste or a flower; in the case of the second arrangement, the last motive often enhanced the middle of the band connecting the scholls.(156, 5). The third sort used a kind of scrolled crockets, sometimes adorned by recurved flowers, between which was a palmatium or a projecting head.(256, 2, 10, 11).

An Etruscan colonnade, as we have seen, did not support a

stone entablature susceptible of a form analagous to that co-
257 mposing the Hellenic frieze. Yet the bands forming the ceramic covering of the wooden architraves sometimes recall the Doric style by an alternation of more or less fanciful triglyphs and rectangular panels relieved by a rosette or head.

The Etruscan mode of treating terra cotta construction favored a development of the polychromy and of ornamentation.

It is a fact, that terra cotta facings were all polycnrome, -- and as shown by the walls of the tombs -- that the walls were covered by paintings applied, either directly on a stone
258 surface or on a fresh coating of lime and sand. The palette of the decorator of pottery was charged with a yellowish white, yellow, red and black; that of the painter with the same colors and also with blue, green and brown.

Doubtless in this country, where artistic metal-working was so brilliant, overlays of metal had their place in architectural decoration.

If not always, at least often, the tympanum of an Etruscan temple was animated by figures in terra cotta fixed by nails to the wooden panels forming the background. Specimens of t these exist, coming from Luna and from Civita Alba.

Etruscan decoration employed conventionalizations of oriental plant origin, such as palm leaves, lotus buds or flowers, figured separately or in a group;(156, 5; 157, 2, 8; 150), r rosettes daisies, lanceolate leaves, and also frets, fret bands, eggs, heart leaves and interlacings of Hellenic importation.

In the number of favorite motives of Etruscan decoration a are counted human or animal masks, heads of men and women, of Medusa, of lions, genii and of monsters, winged sphynxes in Phoenician taste, and images of deities. (150; 156, 4; 157, 10).

267 SECTION II. EGEAN HELLENIC ARCHITECTURE.

From the 8 th century, the Grecian cities planted along the western coasts of Asia Minor-- Phocea, Chios, Lesbos, Teos, Ephesus, Samos, Miletus, Halicarnassus and Cnidor, were in f full flower, particularly Miletus, which rivaled Tyre as an international market and formed a glowing[1] hearth of literary, philosophical and scientific culture.

[1] Note 1. In the decline of the 7 th century, Miletus contributed to the founding of Hellenic science, thanks to the labors of Thales and Anaximenes; in the same epoch, Colophon could pride itself on Xenophanes.

On the other hand, the promulgation of the laws of Lycurgus about the end of the 9 th century, the establishments of the Olympiads in 776, the founding of Syracuse by the Corinthians in 734, and that of Tarentum by the Lacedemonians in 707, in-
270 dicated for Greece proper and its extension eastward, the beginning of a period of order and energy.

From the succeeding century began an architectural production, which was to develop, at least in certain regions, until the decline of the antique world.

Its area, of which Athens was the ideal centre, comprised three regions of invention and a vast field of expansion:-- on the one hand the western coast of Aria Minor and the islands before it, Greece proper at the south of a line joining t the gulf of Ambracia with Thermopyle, Southern Italy south of the latitude of Naples; on the other, the region bordering t the Egean Sea on the north, Asia Minor, Armenia, Syria to the frontiers of Arabia, Cyrenica, Mesopotamia, Persia, central Asia (Bactria, Sogdiana, Drangiana, Arachosia), Himalayan Asia (Cashmere), the upper basin of the Indus (Gandhara); finally in a certain measure, the entire extent of the Roman empire.

Our knowledge of Grecian architecture comprises enormous g gaps and a considerable portion of hypotheses; for most of t the monuments, we are ignorant, both of the precise date of their erection, and of the exact formation of their upper parts; not more than a half dozen may be counted, whose entire elevation is still perceptible.

With regard to the style are distinguished two great provinces, the Ionic and the Doric, which correspond geographically, the former to Asia Minor and the Archipelago, the latter to

Greece, Magna Grecia and Sicily; they touch and mingle in an Attic frontier. Let us add that the Doricism of Greece proper was not identical with that of Greece in Italy, and that the Ionicism of Europe differed from that of Asia.(158 B).

Chapter 1. Demands. -- Monumental Chronology and Topography. -- Periods.

I. The Demands.

Essentially urban and provided with abundant resources by an active practice of industry and of commerce, Grecian civilization must open an ample and splendid career to the art of building.

In truth, private demands were always mediocre. In the cities subject to a personal government, like those in which t the rule was democratic, a display of architectural luxury w would have been exposure to trouble and robbery. Neither the Grecian house nor tomb were monumental; so strongly was their role restricted, that of the former by the mildness of a climate inviting to life in the open air, that of the second by a belief in the migration of the dead into Hades, excluding the necessity of furnishing them with a substantial and comfortable funerary dwelling.

On the other hand, the demands for public buildings were i-important as well as multiplied, as much for republics as for tyrants and kings; they further at the same time were favored by the emulation prevailing between the numerous rival factions of the Grecian world, and by the faculty possessed by them for interesting the mass of the citizens; indeed, the predominance of external life made general the enjoyment of the monuments, while the smallness of the city made more evident their character of common property. And to the effect of the sovereign or of the state were normally added those of private men, who were moved by patriotism, variety, or the desire of gaining popular favor, and assumed the cost of useful or commemmorative structures.

Grecian architecture was drawn in very great measure toward civic undertakings. Without speaking of fortifications, that were often very extensive -- as proved by those protecting t the group of Athens and the Piraeus; of maritime works, sometimes very important -- for example, those of Samos; of installations of sewers-- there may be cited those of Athens from the time of Pisastratos; of water supply, some of which were very remarkable -- as proved by those of Samos and Megara; it received on several occasions a mission to arrange groups; t

that of an acropolis, which was at the same time the citadel, sanctuary and crown of the city; the entirety of an agora, s such as in the Hellenistic epoch was disired by Priene, Magnesia, etc.; the entirety of a whole city -- as realized in t the 5 th century at the Piraeus, Rhodes and Thuroi, and in t the 4 th at Aleandria and Antioch.

The passion of the Hellenes for athletic sports and scenic dramas introduced a considerable demand for gymnasions and p palestras, for the physical exercises and training of athletes; of stadions for races by men, and of hippodromes for those of chariots and of horsemen; the theatres for plays and t the odeions for musical performances. The political life of the republics required platforms an places of assembly, communal houses (prytaneions), and halls for deliberations (bouleuterions); social and economic life created the need of p porticos (stoas) for walks and bazaars, whose facades combined utility and a pleasing appearance; likewise an arsenal, like that of the Piraeus, was conceived in monumental taste, and fountains and time towers had the forms of small buildings; finally from the 3 rd century, intellectual life aroused the erection of places appropriate for teaching, and for the preservation of the monuments of art and of thought, in museums and libraries.

Yet the great affair of Grecian architects was always the erection of sacred edifices. Until its decline, Hellenic civilization made a great deal of religion and was rich in various rites. Each city practised several, having as their objects the gods, frequently considered under several sides of their nature, and heroes, with particular devotion to a patron deity, whose sanctuary was a mystical centre of the country, the inner shelter of its treasury and of its archives. Thus to take an example, Athens revered:-- on the one hand, Z Zeus, Poreidon, Dionysos Eleuthereos, Asklepios, Hephaestos, Artemis Brauronia and Aphrodite Pandemos; on the other, Cecrops, the royal founder of Attica, Pandresos his daughter, Erechtheus, Theseus, illustrius among his successors; finally and especially Athena with the added names of Polias, Promachos, Lemnia, Nike, Erganeos, Hygeia etc. Besides, from all parts of the Hellenic world converged to the consecrated places, that of Olympia to Zeus, those of Delphi and Delos to A-

Apollo, the adoration and votive offerings of states, sovereigns and private men. Therefore by hundreds, the demands for temples, oratories, treasuries and monuments. Doubtless, more than one undertaking was delayed, -- ruch as that of the "Tholos" of Edidauros, that in spite of its small dimensions required a third of a century -- or even remained unfinished-- this was the case for that of the Temple of Apollo at Didyma, that never came to an end in four centuries. Yet in general, the effort was considerable, sustained and fruitful in grand realizations.

II. Monumental Chronology and Topography. The Periods.

Before the 6 th Century.

A small number of monuments may be dated from the 7 th century, and compose the elements of a preface to the monumental history of Greece. These are works of Aeolian Ionia and of Greece proper; on one hand in the Troad at Neandria, on the Tschigri-Dagh the ruins of a temple with central colonnade, and found in the island of Lesbos at Napea near Columdado, at Messa and at Mitylene, fragments of columnr, that are most important objects for the study of the origin of the Ionic o order; on the other are two edifices of the Doric style; in the Peloponnessus at Olympia being a Temple of Hera, the Heraion, at first of wood and crude bricks, whose columns were restored in stone as they decayed, and in Aetolia at Thamos, a Temple of Apollo, singular in its arrangement in two aisles and its decoration by painted terra cotta; let us add the important hydraulic works executed at Megara for the tyrant theagenes.(630-600).

244 6 th century.

A first great epoch of architectural production corresponds to the 6 th century; in fact it exists in continental and insular Ionia and in Magna Grecia -- then in full prosperity, even more than in Greece itself, and it manifests an equal i impetus in both Ionic and Doric art.

At the beginning of the century rose the Doric Temple of A Assos, unique for the exceptional fashion of a sculptured architrave, and two Inoic monuments remarkable for a grandeur of proportions never excelled; the first Artemesion of Ephesus, the work of Chersiphron of Cnossos and of his son Metage-

Metagenes -- burned by Erostratos in 356; a Heraon at Samos, to which as a pendant in the order of useful structures was the celebrated harbor of the city and an aqueduct, admirable for the time, executed by Eupalinor about 550 for Polycrates, an intelligent and magnificent tyrant. To this group is properly added a Temple of Apollo erected in the Egyptian city of Naucratis, conceded to the Greeks by Amasis at the middle of the century, and that the style of the scarce remains makes similar to the Heraion of Samos.

In the other wing of the Grecian world were erected:-- at the beginning of the century on the island of Ortygia at Syracuse, a Temple of Apollo (improperly designated as Artemis) and an Olympeion; at Metaponte, that of Apollo Lykios, called Chiesa di Sansone; the Temple of Tarente; at Selinus, the Temples distinguished by the letters C and D. The second half of the century saw the construction at Paestum of the Temple known by the name of Basilica, and a little later, that of D-Demeter; at Metaponte, the Sanctuary termed Tavola Paladini; At Selinonte, the Temple of Apollo, labeled G or T, in the n-names of the monuments of the place. To these various applications of the Doric formula was opposed an example of the Ionic presented by the first Temple of Looses.

The contribution of Greece proper, continental and insular, appeared much more modest. There was erected then by Corinth, the most flourishing of its cities at that time, a Temple of Apollo; a Sanctuary of the same god at Delos, the religious centre of Ionia; another at Delphi, built in the second half of the century, ruined by an earthquake in 373, also two small structures in the Ionic style, a Treasury and a Hall, the first consecrated by the Cnidians (163) and the second by the Athenians; a Temple at Tiryns, of which fragments remain. Under the enlightened government of Pisastratos (561-528) and of his son 528-510), Athens was organized from the beginning of the century by Solon, and prefaced its artistic destiny by erecting on the Acropolis its first Temple of Athena, the Heka tompedon (Temple 100 ft. long),; in beginning to realize t the programme of the Olympeion, conceived in exceptional proportions, in erecting on the Agora an Altar fo the twelve gods, and in installing a fountain called Enneacronos or Callirhoe.

In the course of the 6 th century was develeped the youth of Grecian architecture; still uncertain and hesitating at t the beginning of the epoch, at the end it was in a way of determining the formulas of the Doric and Ionic orders.

5 th Century.

Maturity occurred in the course of the 5 th century, favored by a happy combination of moral and political circumstances. The two first decades were a singularly critical period for Hellenism, equally menaced from the East by the Persians and from the West by the Carthaginians. Ionia of Asia Minor succumbed, and a century was required for its recovery; hence there is found to cite on its account only the construction of a Temple of Cybele at Sardes (about 440). On the contrary, in the same year of 480, the Hellenes of Greece and of Sicily repulsed the assault with the same success, the former at Salamis and the latter at Himera.

The impulse received during the struggle, the intoxication of success and a wise utilization of the victory determined a marvellous flight, moral and intellectual. Architecture benefited by it, also becoming well served by the ardor for building of some higher statesmen, impassioned for the embellishment of their city; such as Theron at Agrigente, master in power in 488; in Syracuse, Gelon and his son Hiero(485-467); at Athens being Pericles in the course of an administration of thirty years.(461-429).

The efforts of the Sicilian cities were magnificent. Agrigente merits special mention by reason of the number and importance of its undertakings, which its ruin by the Carthaginians in 406 did not allow it to complete; Temples of the Dioscures, Demeter, Asklepios, Zeus Polieus and Hercules; of "Hera Lacinia", a remarkable specimen of Doric art; of Concordia (161), one of the best preserved among Grecian monuments; of Zeus, superior in height to the largest edifices of Asia Minor. Then came Selinonte with its temples listed as A, R, and its "Temple of Empedocles"; Segesta, with its Temple, whose construction was begun about 430 in the best stwle, but was interrupted in 409 by the Carthaginian invasion; Syracuse with its colossal Theatre, etc.

On its part, Magna Grecia signalized itself by the erection

on a promontory near Crotona, of the Temple of Hera Lacinia, a sanctuary common to the Achaian cities of Italy, of which there remains only a single column, and especially at about the middle of the century, by that of one of the masterpieces of Doric architecture, the Temple of Poseidon at Paestum.(159; 200).

The metropolis would have been surpassed by its colonies in the West, if Athens had not assumed this by the advantage of quality, though with a lack of an equal number of monuments. In truth, three Peloponnesrian peoples sacrificed to architecture; before the middle of the century, the Eleans caused to be erected by their compatriot Libon the Temple of Zeus at Olympia, which was overthrown by an earthquake in the 6 th century A. D., and now shows only the first courses of its walls; The Eginetans, doubtless after Salamis, where their fleet covered itself with glory, erected a Temple to the goddess Aphaia; the Phigalians paid the cost of a Sanctuary consecrated to Apollo Epicurios at Bassae, the work of the Athenian Iktinos, who completed it about 430.(Phigalia). The former exhibits the Doric style, which the latter associates with Ionic. At the same epoch, the monumental group of Delos was increased by a Temple erected by the Athenians, and that of Delphi by two "Treasuries", one constructed on account of Sicyon and the other for Athens, the latter dating from the years after Marathon, and which it has been possible to restore.

During the second third of the 5 th century, Attica was an eminent country in the art of building, and the Acropolis of its capital presented the appearance of a work-yard. Exalted by military triumphs, that ensured it the leadership in the Egean Sea, enriched by the earnest practice of industry and commerce, mistress of the control of a treasury into which f flowed the tributes of subjects and the contributions of allies, favored by the possession of quarries of limestone and marble near its walls, impelled finally by a man who wished to make it "in future times the object of the admiration of t the world", to employ his own expression, Athens lavished millions on architects; on Callicrates for a Chapel of Athena N Nike, ordered about 450, and completed by a balustrade in 408 (164); on the same artist with Iktinos for the erection from

447 to 438 of a Temple called "Great" or of Athena Polias, a
and that the extension of the name of a part to the whole, t
the "hall of the virgin"(Parthenon), has endowed with an app-
ellation of glorious memory (187); on Mnesicles for the cons-
truction from 437 to 432 at the cost of $2,400,000, of a tri-
249 umphal entrance to the Acropolis, a marvel of art in the jud-
gement of antiquity; on masters unknown to us for an Odeion
contemporary with the Parthenon; for a Temple of Hephaestos,
improperly called the Theseion, finished about 421(305; 213);
for an Asklepion founded about 420; for a Sanctuary termed t
the Erechtheion, common to Athena, Poseidon and Erechtheus,
commenced about 420, partly burned about 406, and finished at
the beginning of the 4 th century (165). Outside its walls,
it also at about the middle of the century paid the cost at
Eleusis of a "Telesterior", commenced by Cimon and doubled by
Pericles; of a Temple of Nemesis at Rhamnus, and a little la-
ter, of a Temple of Poseidon on Cape Sunion, etc.

It was at Athens in the third quarter of the 5 th century,
250 that Grecian architecture accomplished its splendid maturity,
both in Ionic, as well as in the Doric forms. Predestined by
its position on the frontier of the two great provinces of t
the Hellenic world, favored by the opportunity of soaring at
a time, when all problems had received nearly approximate so-
lutions, incited to refinements by ample resources of which
it disposed, and by the exceptional power of constructing ev-
erything in marble, the Attic school attained in the executi-
on of details as in the arrangement of the whole, a degree of
perfection in technics and form, which made it the undisputed
queen of its national rivals and a model for the course of
time. [1]

Note 1. Let us recall the exact synchronism of that splen-
did architectural flowering with an intellectual flight meas-
ured by the productions of Sophocles (about 495-406) and of
Euripides (480-407), of Aristophanes (about 450-after 390),
of Thucydides (470-about 395), of Socrates (469-400). Note
again that it was contemporary with the epoch in which Athens
assumed the role of sole capital of the Hellenic civilization,
of the rallying centre for the masters of thought. It was i
indeed about the middle of the 5 th century, that Anaxagoras

of Clazomene inaugurated within its walls the teaching of the sciences, Hippocrates of Chios that of Geometry, **Protagoras** of Abdera -- who was soon to compete with Gorgios of Leontinum-- that of Rhetoric, etc.

First Half of the 4 th Century.

With the 5 th century closed the heroic epoch of Grecian a architecture. The first half of the succeeding one is marked by an evident reduction of the monumental demand. Henceforth or nearly so, from the previous regular and abundant production of the West, it was exposed to repeated attacks by the Carthaginians, Etruscans, natives, and soon of the Romans. Syracure alone prospered and was beautified under Denys I. (406-367).

The Ionia of Asia Minor ended by yielding to the misfortunes produced by the Persian wars. In Greece proper, Athens was under the effects of disasters suffered during the war of the Peloponnessus; at least we can only find to attribute to it during that epoch the completion of the Erechtheion in 395, and the erection of a graceful "Tholos" in the Marmaria of D Delphi, Doric externally and Corinthian in the interior. The Peloponnessus supplemented this in a certain measure by erecting at the beginning of the century a Temple of Zeus at Nemea, its relegious centre; a Tegeion, a Sanctuary of Athena Alea, the work of the Parian sculptor Scopas; A Metroon at Olympia; particularly at Epidauros an important group of religious and secular monuments; a Temple of Esculapius, buildings for the use of pilgrims, a "Tholos", the object of the admiration of the ancients, and finally a Theatre, regarded by antiquity as the masterpiece of the kind (174), both designed by the architect Polycletus about 350. Let us add for the account of Macedonia at Palatitza, the ruins of a Palace attributable to the reign of Archelaos.

The style of these monuments, which are of beautiful quality, tends more toward greater elegance in forms and richness in decoration.

From the Middle of the 4 th Century.

This development occurred in the course of a fifth epoch, that began about the middle of the 4 th century, and it is c characterized by a displacement of the axis of Grecian archi-

architecture, transferred to the localities where it had first been, on the western coasts of Asia Minor.

The architectural demands of Greece proper remain small and modest. Athens, under the good financial administration of Euboulos (354-339), erected -- both from the plans of Philo-- the Arsenal of the Piraeus, commenced in 346 and finished in 328, one of the most celebrated monuments of Grecian architecture and one of the best known, thanks to the discovery of t the specification for its construction, and the facade of the "Telesterion" of Eleusis erected 346-311. The restorative g government of Lycurgus (334-327) was marked by the undertaking of the Theatre of Dionysos and of a Stadion for the Panathenaic games, while the intelligent self respect of a victorius choragur met the cost of the charming "Monument of Lysicrates".(334).(199). Then the demand lessened, reduced to that of small structures commemorating choragic victories, like the "Monuments of Thrasyllos (320) and of Nicias"(319). In the 2 nd century it was slightly increased by the munificence of foreigners; about 174 Antiochus Epiphanes, king of Syria, resumed work on the Olympeion, projected by Pasastratos and whose compfetion was delayed until the epoch of Hadrian; on their part, Eumenes II (197-159) and Attalos II (159-138), kings of Pergamus, each endowed the city with a superb portico. A hydraulic and solar clock, termed the Tower of Winds, was the work of Andronicos of Cyrrhos in the course of the 1 st century, and Odeion was built at the cost of Ariobazarnes II, king of Cappadocia, in the place of that of Pericles, burned in 86, closing the series of edifices preceding the Christian era.

The schedule of the monuments of the remainder of Greece a and of the Archipelago for the same epoch is no longer imposing.

The part of the 4 th century comprises at Delphi a Temple of Apollo erected between 365 and 330 to replace that of the 6 th century, overthrown by an earthquake; at Megalopolis and at Messene, structures following the founding of those two cities in 370 and 369; in the former being the largest Theatre of all Hellas and a vast assembly hall, the Thersilion; in t the second a small Temple consecrated to Artemis Laphria; at

Lycosura a Sanctuary of Despoina, common to all Arcadia; at Eretria in Eubea, a Theatre; at Olympia, an inn for visitors of distinction called Leonidaion, the circular structure termed Philippeion, dedicated by Philip II of Macedon in 336.

On the account of the 3 rd and 2 nd centuries fiqure substantially the embellishments of Delos, that had become one of the most important Maritime emporiums of the eastern Mediterranean; a third Temple of Apollo, the largest of the group, a Theatre, a Portico, the gift of Philip V of Macedon (about 200), and a singular edifice under the shelter of one of the seven wonders of the ancient world, the "Horned Altar of Apollo", and which owes to the form of its capitals its name of
218 "Hall of the Bulls"; the Propyleion called "southern", the g gift of Athenians in the second half of the 2°d century; two monuments on Samothrace, the Arsinoeion and the Ptolemaion, the first erected by the daughter of the Lagides, the second by Ptolemy II, and the Temple of Zeus Basileus at Lebadeia (Livadia) in Beotia, whose building contract was made at the beginning of the 2 nd century and forms a precious document for the history of art.

On the other hand, Ionian Asia Minor and the Hellenized
219 countries after the conquests of Alexander and his successors were characterized by the number and importance of the demands, some by the cities and others by the sovereigns.

From the first quarter of the 4 th century dates the "Monument of the Nereids" at Xanthos in Lycia, a monumental tomb prepared for the prince of that locality. A series is remarkable for the grandeur of the programmes and the quality of the productions, doing honor to the second half of the century. It commences with the famous Mausoleum at Halicarnassos, the tomb of Mausolus, satrap of Caria, the work of Pythios between 353 and 349 (186); it continues with a second creation of the same architect, nearly contemporaneous and equally famed, a Temple of Athena Polias at Priene (220), and with a S Sanctuary of the same name, erected on the Acropolis of Pergamus. It comprises two colossal edifices; the second Artemesion of Ephesus, built in the third quarter of the 4 th century by Paeonios of Ephesus, assisted by one named Demetrios; the Temple of Apollo at Didyma near Miletus, whose plans were

devised by the same architects before 334, and which was abandoned unfinished in 41 A. D.(239). The list must be extended by the mention of the great works at Alexandria: the planning of the city by the Macedonian Deinocrates in 331; erection of the Museum and the Library under Ptolemy I Soter (323-285); construction of the Mole and the Lighthouse by Sostrates of Cnidos on account of Ptolemy II(285-247).

The last third of the 3 rd century saw the erection at Magnesia on Meander of a Temple of Artemis Leucophryne; at Teos, a Temple of Dionysos; at Tralles, a Sanctuary of Asklepios; the two first works by Hermogenes and the third by Arcesios, two masters equally celebrated.

The first half of the 2 nd century was made illustrious by the embellishments of Pergamus, the capital of the Attalides, which under the government of Eumenes II (197-159) was not o only one of the centres of Hellenic civilization, but likewise a centre of architectural activity; the memory of this is preserved by a great Altar consecrated to Zeus and to Athena. We may cite as dating from the end of the 2 nd and the beginning of the 1 st century; at Alinda a curious portico bazaar; at Labranda in Caria, a Temple of Zeus Stratos; at Aizani (Chayder Hissar), a very remarkable group, comprising a grand T Temple of Zeus, Theatre, Stadion, Gymnasion etc.

Under the influence of Asiatic genius, this oriental branch of architecture developed decidedly in the sense of effects capable of pleasing the eye and of striking the imagination. There results from it a search for material grandeur, real or apparent, for picturesque reliefs and richness of decoration, that causes the proscription of the Doric style in favor of the Ionic, which in its turn is competed with by the Corinthian; the sacrifice of the quality of the elements to the general appearance; finally infractions more or less serious of architectural logic. Yet the level of the production of the 4 th century remained very high.

Thanks to the "Roman peace", Grecian architecture continued to flourish, particularly in Asia Minor during the first two centuries A. D., producing works as remarkable as the Temple of Rome and Augustus at Ancyra, the Temple of Aphrodite at A Aphrodisias (1 st century), of monuments and particularly the

Theatre of Aspendos in Pamphylia (176; 177), those of Temenos in Pisidia and the "rajaneum of Pergamus. Untel the 3 rd century, it maintained its empire over southern Syria, according to locality, being more or less affected by Roman or oriental influences. But from the 2 nd century, it manifested a tendency to heaviness and overloading, and it had degenerated in the 3 rd century.

In Greece in the same period -- excepting the Olympeion of Athens, finished a little after 130 (166), -- architecture w was only occupied with secondary needs; the erection at Athens at the extreme end of the pagan period, of a small circular Temple of Rome and Augustus; of the Tomb of Philopappus ((about 115); of the Arch of Hadrian; of an Odeion at the cost of Herodes Atticus (after 161), the construction at Salonica in the 2 nd century, of a Basilica, whose ruins are named the Incantada.

Chapter 2. Natural, Human and Technical Conditions. -- Influences.

A combination truly unique and propitious conditions determined the brilliant destinies of Grecian architecture.

I. Natural Conditions.

And first was the opportunity of a ready supply of stone materials of superior quality.

457 In the entire extent of its area,,Grecian construction disposed of excellent common limestone;[1] better still, Greece p proper, the Archipelago and Asiatic Ionia were abundantly provided with marbles of different kinds.[2]

Note 1. Notably in Attica was derived from the peninsula of Akte a yellowish travertine, easily worked and carved, also resistant to the weather; in Sicily was found a porous limestone, grayish or yellowish white, and receiving well a coating of stucco.

Note 2. Attica extracted from the slopes of Pentelicos a dense and hard stone with very fine grain, whose white color after a certain time assumed a yellowish tint; from Laurium, an ordinary marble; from Hymettos a very solid material of b bluish gray color with darker veins; finally, from the quarries of Eleusis, a dark blue limestone. Southern Eubea, especially about Carystos, contained a grayish marble veined with green, quarried in great blocks, termed "cipolino" by moderns, of which the Romans made great use. Megara offered a kind, remarkable for softness and whiteness. Without mentioning t the sort that Paros supplied, and whose quality reserved it for statuary, the precious stone abounded in the islands, at Naxos, Skyros, Tenos, Andros, Thasos and also at Chios, rich in "variegated brocatello", And Asia Minor was a rival on t the one hand, due to the splendid white marbles furnished by the valley of the Caister near Ephesus, the islands of Khorsiae opposite the mouth of the Meander, the coasts of Herakleia and of Mylasa, etc., and on the other, to the polychrome marbles of Rhodes and of Phrygia, among which were particularly famed the red and white "pavonazetto".

The same for transportation; the difficulties opposed to it by the accidental conformation of the ground and the bad state of the roads were largely compensated by the location of

most Grecian cities on the coast or near the sea; this notably allowed them to supplement by importation the insufficiency of native resources in structural woods.

To nature in Greece, architecture further owed the favor of a mild and dry climate, favorable for the execution and preservation of the monuments, and also that of a marvellously p pure air, whose transparency increased the visibility of appearance, made the eyes more sensitive, taste more critical, and the perfection of the work more appreciable.

II. Human Conditions.

In contrast to the architectural styles forming the object of our studies until the present time, and whose productions almost exclusively depended upon a sovereign or a caste, that of Greece was national in a larger measure. Without falling into the exaggeration of the hypotheses, which attribute the passion and sentiment for art objects to the mass of the Hellenes in general and to the Athenians in particular,-- Hypoth-
258 eses contradicted in all concerning architecture by two facts, that the iniative for all great monumental undertakings came from individuals, and that Pericles was accused of squandering -- one may affirm that Grecian architects found in the peoples profoundly permeated by local patriotism, generally endowed with keen minds cultivated by travel and further rich in leisure, an attentive public, sympathisizing with their effects and possessing good judgement.

One has difficulty in imagining political and social conditions more favorable to artistic progress, than those by which Grecian architecture benefited.

Nothing could be more propitious than the harmonious alliance of variety and unity realized on the one hand by the division of Hellas into two great provinces of different temperaments, the Ionian and the Dorian, and into numerous independent states, possessing individual personalities and jealous to preserve them: on the other being the number and closeness of the relations joining these individualities in commercial and political connections, the periodical and frequent gatherings at the national solemnities, and finally the facility w with which the artists were transferred. Indeed from the multiplication of the schools and the rapid communication of lo-

local inventions resulted in very large measure that continuity and regularity of progress, which constituted one of the most striking and most characteristic traits of Hellenic architecture.

Likewise strong and equally happy was the influence of the regime of civil liberty, common to the Grecian cities. In i imposing on the art of building, instead of the economical a and elementary system observed until that time, of execution by the forced and inexperienced labor of a multitude of levied men, the very superior by onerous system of professional and salaried labor,[1] it interdicted colossal programmes and incited to a search for the effects of beauty, rather than t those of material greatness.

Note 1. Note some indications of the mode of realizing a frogramme for public architecture. A director general organizes and supervises the work, for which in a democratic country he renders account to the people, that elected him. Thus in the 4 th century, Philo, designer of the celebrated Arsenal of the Piraeus, explained to the Athenians assembled in t the theatre, how he had carried out his mission.

The stone materials were furnished by the state, which generally had them quarried by the public slaves. The execution of the main work was let by contract to builders furnishing security. Payment was made at three times; after securing t the work, the contractor received 4\5 of the price; when it was half completed, he received 1\10, and the remainder after the work was finished, provided this was not subject to deductions for bad work or delay. The director general fixed the list of prices and passed charges. Undertakings were much s subdivided, the portions being successively let. Finally, f for delicate works, dressed facings and sclupture, it appears that these were let by the piece.

219 The last statement is found to be strongly confirmed by the mental disposition of the race, considered as a whole. Meditative and practical, observant and thoughtful, very slightly poetical and mystical, impressed by clearness, precision and order; less inventive than ingenious and subtle; thoroughly logical, struck by analysis and dialectics, inclined to system and to sophism, prompt to codify theories and to fix rules,

the Hellenic genius must necessarily manifest itself in architecture by a disposition to advance by gradual perfections, rather than by innovations; to seek for rational methods, economical procedures, arrangements appropriate to the purpose, forms expressive of the structure and the function; to be pleased by refinements and harmonious arrangements, with a tendency to purism, to coldness and to formulas. [1]

Note 1. The sequence of our exposition will place in evidence this esthetic temperament. Henceforth we shall emphasize as one of the typical manifestations, the admirable precision that characterizes the specifications remaining to us; the least details are therein given with minute care. Furthermore, the mention made of "models"(paradeigma) seems to indicate, that they took the precaution of sketch models.

Note also as a characteristic trait, the marked taste of H Hellenic architects for theoretical speculations; it is attested by the preparation of essays relating to personal undertakings, or of general treatises.

Yet the development of these general tendencies must be different -- on the one hand directed toward effects of force and dignity, or on the other toward these of grace and richness, -- according to whether in the case the Dorian or Ionian temperament dominated. The meeting of both in Athens, the m marketplace of Hellas, predestined Attic architecture to a s style both complex and pure; in fact in its maturity, it divided its favor between the Doric and Ionic styles, even to a associate them in the same edifice, and it created the classical formulas of both, correcting the simplicity of the first by a little of the second and inversely.

III. Technical Conditions.

Note finally, that the fulfilment of the architectural vocation of Greece was facilitated by the possession of means of execution singularly perfected in comparison to those at the disposal of the schools previously examined. Besides it benefited by the mathematical speculations to which the Greeks were early and passionately devoted, it derived an advantage from the progress of metallurgy, which furnished stonecutters and sculptors with practical tools, and it had at its service hoisting machines relatively powerful, permitting a rapid and

safe handling of the materials.[1]

Note 1. The Greeks employed the pulley, crane, windlass, capstan and sling.

IV. The Influences.

Daughter of a civilization developed on the Egean basis and nourished by Chaldean science and Egyptian "wisdom", Grecian architecture profited in the most ample measure from the experience of its local and oriental predecessors. From Mycenean art it borrowed the principle of the programme of the temple and that of the Doric order, for which it perhaps also h had obligations to Egypt; to Asia Minor it was indebted for the formula of the Ionic order; finally, it drew largely from the ornamental treasury of Egypt and of Asia, Phoenician, Mesopotamian and Hittite. But all that it took, it made its own by virtue of a style, that emphasized everything from the point of suitability, harmony and proportion.

Chapter 3. Programmes and their Realizations.

In a general way, Grecian edifices possess the primary quality of an architectural work, fitness for their purpose. Their form and arrangement are orderly, simple, clear and practical. Also the fact, that almost always the name of each of their elements is equivalent to a definition of its role, indicates that the programmes were thought out by men properly convinced, that the function should create the organ.

I. Civic, Miliatry and Secular Programmes.

The City.

Every ancient Grecian city was a labyrinth of narrow and c crooked alleys, with some open spaces for use as markets and places of assembly, badly defined and encumbered by chapels, fountains and booths. For new cities, the 5 th century inaugurated and those following developed even to excess the fashion of systematic and regular plans, broad and straight streets, sometimes bordered by colonnades, and clearly limited s squares, partially or entirely enclosed by porticos.

In every epoch the Greeks loved to impress an architectural appearance on the public fountains. As revealed by vase paintings and by ruins, their shape sometimes formed a niche, s sometimes a porch against a wall, or sometimes a kiosk with columns; this might even be a monumental arrangement for a w water basin, like that at Olympia, whose cost was paid by Herodes Atticus.

Grecian fortification was relatively wise; it was not restricted to erecting solid ramparts furnished with battlements and slots, with walks along their tops -- sometimes covered -- or as balconies along their inner sides; to multiplying enclosures and excavating ditches; it further practised zigzag or sawtooth outlines, the flanking of walls by towers generally square, but sometimes polygonal or circular, and the defense of gates by the projection of the bastions or by a deceitful arrangement.(168).

The House.

Without realizing comfort, the programme of the Grecian house -- such as revealed to us at the end of its development by the ruins of Priene, Delos and Thera -- is appropriate to the climate and the customs; for it ensures both that enjoym-

enjoyment of the open air, the shade and coolness, which the serenity, heat and luminosity of the Mediterranean sky caused to be desired, and that intimacy of domestic life, that half 262 seclusion of the women suited to a civilization approaching in a certain measure those of the East.(169).

The key of every arrangement was a court around which were found the different rooms, generally separated from it by a portico, from which they derived a weakened light, and which in itself formed a shady and ventilated apartment; the rooms were high--they generally reached 16.4 or 19.7 ft. at Delos; the roof was chiefly a terrace suited for nightly repose during the hot season; the ground was paved or covered by mosaic. Subterranean cisterns collected the rain water.

Every precaution was taken to isolate the dwelling from the outside and to establish in the interior a distanct separation between the portion devoted to social life (andronitis) a and that reserved for private life (gynaikonitis). Ordinarily the facade had no opening other than the doorway; if pierced by openings, these were small and placed high. The entrance was generally modest and narrow, but sometimes furnished with a small porch (prothyron). It gave access to a corridor on which opened the porter's lodge, and which among the wealthy was enlarged to form a vestibule (thyroreion). The principal room of the house -- termed "oikos"-- where was kept t the domestic hearth, and which served for a dining and sitting room, was situated north of the court, so as to benefit by the sun in winter. This was an apartment of sometimes considerable dimensions, that received light either through the doorway alone or by two windows pierced at its sides, or by a triple entrance. It was sometimes preceded by an open vestibule, enclosed by two extended walls and columns (prostas, p prodromos). On the contrary, the sleeping room (thalamos) w was small and dark. A small garden completed certain arrangements. Commonly the elevation comprised at least a second story, accessible by stairs in wood or stone.

The great defect of the Grecian dwelling was in vicinity of the same court, of the apartments of the master, kitchens, o outbuildings and lodgings of slaves.

Public Edifices.

264 Public Edifices.

Prytaneion, Bouleuterion. Lesche. Portico. Gymnasion. Theatre. Odeion. Stadion. Hippodrome.

A Prytaneion was the communal inn where dwelt the group of prytanes, charged with maintaining the hearth of the city and with entertaining the guests of the state, differing from the
265 house of a rich man only by the increased dimensions and by an enlargement of the "oikos". (170, 1).

As for the Bouleuterion, intended for assemblies of the magistrates, it substantially comprises a hall, where steps rise on a rectangular or semicircular plan. (170, 2, 4).

The Lesche of the Cnidians at Delphi gives us an idea of t the places of reunion designated by that name, a sort of club in which the Greeks loved to meet each other; it was a rectangular room, whose ceiling was supported by a series of eight columns.

The Stoa (covered portico) rendered the same service to loungers and to traders, and resulted from setting a row of isolated supports either in front of a rear wall -- in which c case it was not rare that the former was doubled or even tripled -- or on each side of a middle wall; the gallery was sometimes in two stories, like those erected by Attalos II at Athens and by Eumenes II at Pergamos.(167). The dimensions might be considerable; the Stoa of Attalos at Athens measured 368 ft. long and 64 ft. deep, that of Eumenes having the cor-
266 responding dimensions of 535 and 52.5 ft. When the purpose of a portico was commercial -- it then bore the significant name of show room (deigma), -- it comprised an alley portion for exhibit and sale and a storeroom part; either arranged on the same level and bordering the first, as at Magnesia on Meander (171, 1), or in a basement, as at Egae, Alinda (171, 2 3) and Pergamus.

The plan of a Grecian Gymnasion (palaistra, gymnasion) was adapted to its twofold purpose of a place for physical exercises and a centre of intellectual life; on the one hand, an arena open to the sky, vast covered areas for the case of bad weather, porticos for walking or for rest, chambers, halls f for ablutions and baths; on the other, small and large rooms arranged for conferences or academic sittings.(172).

The arrangement of the Grecian Theatre did honor to its inventors, for it was an elegant solution of a quite difficult problem. On the one hand, the representations given there w were composite, associating parties of the chorus, of dancers, and of the dramatic action; on the other, the number of spectators was considerable, always several thousands, sometimes exceeding twenty thousand as at Athens, Miletus, Megalopolis and Syracuse. The Grecian architect understood now to favor the development of the play and to ensure the convenience of the public, by arranging at the centre of a stepped semicircle termed theatron or koilon (hollow place), a circular area called Orchestra or conistra, behind this and tangent to its circle and parallel to the chord of the limiting arc of the entire plan being a platforl, the stage (scene).(173; 175; 177).

To realize the semicircle, the practical genius of the Greeks always endeavored to economically utilize an accident of the site; sometimes using a valley and sometimes the slope of a hill or rocky eminence, completing the natural formation by means of excavation or filling. Besides, whether excavated in the rock or built, the seats were formed by simple steps; only those situated in the first row became places of honor (thrones),and were both distinguished and made more comforta-
267 ble by the addition of backs and arms. Note that the lack of a covering left the public and the actors exposed to sun and rain.

Limited at each side by a transverse supporting wall and at the top by a wall or a circular portico, the semicircle was divided into sectors (kerkides) by stairways radiating from the orchestra and upwards in two or more zones separated by a wide step (diazoma).(173, D).

This subdivision was well adapted to favor passage, but was not the only mark of the firesight of Grecian architects. T There was another in the adoption for the contour of certain theatres -- for example,that of Epidauros -- of a composite horseshoe outline, by which the visibility of the drama was increased. Such was again the precaution of opening between the ends of the semicircle and stage, of a wide passage through which the crowd of spectators could easily pass; also th that of multiplying the stairs in the upper zone on account

of the increased length of the steps, and also as the case at
268 Epidauros to change the profile of the part above the diazoma (of the upper zone), so as to lessen somewhat the distance to the last rows.(174). Praiseworthy is also the ingenious idea of recessing the face of each step to allow bending the legs, and of sinking its upper surface to furnish a resting place for the feet of persons on the next row above.(174).It is necessary to mention the care taken to ensure removal of rain water by means of a channel cut at the base of the semicircle.

The orchestra, at the centre of which rose an altar consecrated to Dionysos, and which was the centre of the acts of t the chorus, had no fixed dimensions; the ratio of its diameter to that of the semicircle was one third at the Theatre of Epidauros, one fifth at the Theatre of Athens. Its area was composed of a layer of tamped earth -- this is the case at Epidauros -- which perhaps was covered by a floor, sometimes by a mosaic pavement, as at the Theatre of Delos, or sometimes by slabs of marble, as at Athens.

The stage was substantially composed of a platform raised 4.9 to 11.5 ft. above the ground of the orchestra,and accessible by stairs or ramps. The space beneath it, termed "under the stage" (hyposcenion), was utilized as a storeroom for the materials and as a room for the actors, being closed on the side next the orchestra by a wall pierced by doorways, and t that bore the name of"proscenion"(before the stage).[1] The front portion of the platform for a width of 4.9 to 8.2 ft. fo-
269 rmed the tribune expressly named "logeion" (speaking place), where the actors declaimed while the rear portion served for behind the scenes.[2] The platform, after the reduction of the chorus had determined a devlopment of the stage at the expense of the orchestra, was closed at the rear by a wall surmounted by a sounding board and shaped like the facade of a p palace, as may be seen at the Theatre of Aspendos, and along the ends by a sort of projections for use as side scenes, termed "Parascenia".(176; 177).

Note 1. According to a theory by M. Dörpfeld, in the Hellenic period the place of the actors was in the orchestra, the stage being no more than a tent or shed serving as rooms or storerooms.

Note 2.

Note 2. If we select as the best preserved example and the most successful of Grecian theatres, according to Pausanias, that of Epidauros, the following statements are given:-- the auditorium (koilon) comprises 55 steps, the last of which was 74 ft. above the floor of the orchestra and nearly 194 ft. f from its centre, being at the middle of the curve nearly 230 ft. from the stage! Behind the 34 th step and at the height of 37.8 ft. extended a passage 6.2 ft. wide. The orchestra, properly so-called, of tamped earth and defined by a stone border 1.25 ft. wide, and separated from the internal curve of the auditorium by a channel measuring 6.9 ft. between curbs, has a diameter of 64.0 ft. Finally the platform is 72.5 ft. long between the side scenes and is 11.6 ft. above the orchestra. The acoustics are excellent.

The plan of a theatre frequently comprised porticos on the exterior, very much appreciated in case of showers.

270 The essentials of the arrangement of the Grecian theatre w were found again in the disposition of three edifices of analagous purposes:-- the Odeion, which was set apart for musical performances, the Stadion and the Hippodrome, of which the f first served for the spectacle of the games, the second for chariot races.

The odeion only differed from a theatre in being smaller a and covered.

The Stadion was composed of a straight track -- the length of a measure unit of 500 ft.,-- 30 ft. wide, and of an auditorium rising in steps around it, sometimes crowned by a promenade beneath a portico,-- as it was at Messene, Prieue aod Aphrodisias. Sometimes -- for example at Olympia and at Epi-Epidauros -- the plan was rectangular, and there were seats only along the two longer sides; one of the ends was sometimmes rounded and rows of seats extended around it; it was thus at Athens and Delphi; or indeed as at Aphrodisias and at Laodicea, both ends were alike, in which case the edifice received the name of amphitheatre.

As for the Hippodrome, it was nothing more than a great stadion with arrangements on the track for starting and turning of the chariots. [1]

Note 1. Compare the Roman Circus.(Book III, Part 2, p.4616

II. Religious Programmes.

The Temple.

According to the ordinary conception of the ancient East, the Grecian temple was properly the dwelling or lodging of a deity, where it was actually present under the form of a statue and received homage and offerings. Yet was distinguished from the divine mansions heretofore visited by us by a simplicity of plan and moderate proportions,[2] which are explained, both by the small development of worship, by its restricted character, and by the obstacles presented to the conception of vast programmes by the economic and social conditions of the architectural productions and the esthetic tendencies of the race.(Page 259).

Note 2. See Chapter 5, page 316 for the dimensions.

Just as the Grecian deity was represented in the image of man, so his dwelling was imitated from the portion intended
271 for receptions an a Grecian house. As appropriate was taken a model from the best in that kind, the megaron of the Mycenean palace, in relation to which the affiliation of the Hellenic temple appeared evident and direct; indeed in the freed cities, the sovereignty of the gods had replaced that of the kings.

The essentials of a temple were reduced to a hall (naos, sekos, adyton, cella), at the rear of which was found the divine image, sometimes in an area enclosed by a balustrade, traces of which are still observed in the Temples of Zeus at Olympia and of Athena Polias at Priene.

For furniture were an altar, tables, ritual instruments and articles of value, propriatory or votive offerings. Crypts w were exceptional.[1]

Note 1. As examples may be cited those excavated , at Athens beneath the Sanctuary of Poseidon in the Erechtheion; at Epidauros under the "Tholos"; at Aizani under the Temple of Zeus.

272 The naos formed a parallelogram, generally elongated. Almost always was it orientated from East to West, the entrance being at the East. It was a rule, that it was placed on a stylobate (crepis), i.e. on a concentric and more or less elongated base of rectangular plan, whose footings projected b

beyond its top, with its faces profiled usually in steps and rarely vertical; ascent was made either by the steps of the stylobate themselves, or when these were too high, by a stairway of by a ramp, the mode in the Peloponessus, both arranged at the eastern end.(214).

Yet this elementary programme, realized examples of which may be cited in a Temple of Demeter at Gaggera near Selinonte (178, 1), and in the most ancient Sanctuary of Apollo on Mt. Cynthos at Delos, was the object of various developments in plan and elevation.

And first and almost always, in conformity to the requirements of a well understood display, access to the sanctuary w
273 was retarded by the addition of a vestibule, termed pronaos or prododos. The arrangement of this varied. Generally it resulted from a prolongation of the side walls of the naos. Sometimes these were returned at a right angle to enclose a closed hall, accessible by a doorway,[1] as may be seen in several temples of Selinonte.(178, 2). Most frequently in this case the edifice is termed in-antis -- the vestibule was open in front and enclosed on this side by the columns supporting its roof and by grilles; the Temple of Themis at Rhamnus presents an example of it. This type of pronaos was susceptible of development in depth, an idea of which is given by the Artemesion of Magnesia on Meander (178, 3), that of Ephesus (2 (215, 1), and the Temple of Apollo at Didyma.(178, 6). Often -- in which case the temple was termed prostyle -- the lateral walls of the pronaos were shortened more or less, the parts suppressed being replaced by one or several isolated supports; that is observed on a small "Temple of Empedocles" at Selinonte.(178, 4). It is even not rare that the projections were entirely omitted and the porch became a portico; it is thus at the Temple of Athena Nike at Athens,(178, 5);164) and at the Sanctuary of Athena at the Erechtheion.(179, 4; 165).
274 Again sometimes the vestibule was double, the pronaos being preceded by a sort of external portico with columns.[2] Finally, it occurred that the vestibule was doubled by a sort of intechamber; thus at the Temple of Didyma the pronaos was separated from the naos -- otherwise under the open sky -- by a waiting hall for the use of the devotees, who came to consult

oracle of Apollo.(178, 6).

Note 1. See Temples C and S.

Note 2. For example the Great Temple of Selinonte (178, 7); at Athens, the Temple of Dionysos Eleuthereus and the Sanctuary of Poseidon at the Erechtheion, and at Samothrace, that of the Cabyres.(178, 8).

Some temples had their cells divided into several halls; t this complication [2] was doubtless required in certain edifices by the coexistence of two sorts of worship of the same deity regarded under different aspects; in others by the fact of the residence of two deities under the same roof.

Note 2. It appears to have been the fashion at Selinonte, where it was shown by no less than four examples. See Temples C, D, R and S.

The arrangement was usually realized by means of a transverse wall. Access to the rear sanctuary was sometimes through a doorway in the partition (179, 2), sometimes by a special entrance either opened in the rear facade of the edifice -- as at the first and second Parthenon of Athens (179, 1, 3) a and at the Temple of Mantinea, which Ares divided with Aphrodite, -- or in the side, as at the Temple at Phigalia (180, 6) and at the Erechtheion of Athens. (179, 4). The superposition of the two sanctuaries was exceptional; it characterized a Temple of Sparta, in which was worshiped on the ground floor Aphrodite Promachos, and Aphrodite Morpho on the upper floor.

275 In certain temples -- not numerous and several are of small dimensions, -- the cell was diwided into two or three aisles by one or two rows of columns aligned with its axis. The division into two aisles by a middle colonnade, examples of which are offered by the Temple of Neandria (180, 2), the primitive Temple of Locres, that of Thermos, the "Basilica" of Paestum, appears to be the most ancient and was abandoned early. That in three aisles, the middle one wider, and sometimes -- the Parthenon presenting an example -- closed at the rear by a transverse colonnade, which isolates a sort of ambulatory (180, 4), is complicated by a division of the side aisles into two stories by a floor placed at about mid-height (181; 200). The purpose of this upper story is uncertain; a

although it singularly aided in the solution of the problem of the roofing, the series of isolated supports plays no structural part, since this is found in edifices as narrow as t the temples of Egina, and it is wanting in others of twice the width; on the other hand, the access to the galleries by stairways like those of which traces are found in the Temples of Zeus at Olympia, of Poseidon at Paestum, of the Temple of Concord, of"Hera Lacinia" and of Asklepios at Agrigente, was too inconvenient for retaining the hypothesis of public tribunes. Doubtless these upper parts are to be regarded as storerooms or treasuries.

An exceptional arrangement, applications of which are offered by the Heraon of Olympia and by the Temple of Phigalia (180, 5, 6), connects the columns to the side walls of the cell, t thus determining an equivalent of the side chapels of mediaeval churches.

276 The cell was generally covered, as proper beneath a sky that sheds rain. Indeed the exceptions were sufficiently numerous, that the classification made in antiquity for the various sorts of temples reserved for them one of its classes, t termed hypethral, otherwise under the open sky. Since these are presented to us, not only by very wide aisles as at the Temple of Apollo at Didyma and at the Olympeion in Athens, b but also by those relatively narrow, like that of the Temple of Phigalia (180, 6), one cannot explain them by inability in construction. In any case, they had as a consequence the arrangement of a shelter for the statue of the deity; at Didyma, this was a tabernacle; at Phigalia, a large chapel.

Like the living room of the Grecian house, through the doorway the cell of a temple received light and air for the most part, the lighting thereby received amply sufficing; besides that shadow was better suited to a sanctuary than full lighting, the dimensions of the opening were such, especially in
277 height, that the ratio of area of its opening to that of the surface to be lighted, under the clear sky of the eastern Mediterranean, was superior to that appearing rigorously acceptable for a living room under the foggy sky of northern Europe.[1] It is also probable, that except on solemn occasions, they w were contented with the lighting supplied by a transom arran-

arranged over the closed door.

Note 1. Thus at the Parthenon the opening of the doorway was to the area of the middle aisle as 1 to 5, when in north-east Europe, people are accustomed to windows, whose ratio to the extent of the room is 1 to 10.

That a Grecian temple might realize the finished type of t the species, it was necessary that in addition to all the elements previously mentioned, its programme should comprise an opisthodome (treasury) and a peripberal portico (also called pteroma), otherwise meaning a repetition of the pronaos at t the rear end and a continuous portico on columns.

The opisthodome does not usually communicate with the cell, so it may be doubted that it had a useful purpose; yet, closed by grilles, it could render the same service as the internal galleries of the cell, i.e., shelter a surplus of furniture.

The peristyle, the principle of which is sought in the series of open galleries enclosing the court of honor developed before the Mycenean megaron (128, 2), constituted both a shady promenade for the use of the faithful, a shelter for objects vowed to the deity, and a precious element of esthetic e effect. According to epochs and places, its role was more or less important; in the 6 th century, it far excelled the sanctuary, since it alone occupied three fourths of the total area of the platform (182, 2); the classical period conceded to it scarcely half that extent (182, 1); finally the Hellenistic age favored it anew. It was developed sometimes by spacing the columns farther from the walls (182, 3), sometimes by doubling the row, as at the Temple of Apollo at Selinonte, on the facade alone, or as the Olympeion of Athens and the Temple of Didyma, on all sides (182, 4).[1]

Note 1. The antique architectural terminology applies the term peripteral to every temple provided with a peristyle, d dipteral to those with a doubled portico, and finally to those where the portico was made wider, that of pseudodipteral.

The peristyle was at this point an integral part of a normal temple programme, that if by chance, as the case for the unfinished Temple of Zeus at Agrigente, an excessive enlargement of the scale prevented the realization, at least was suggested the idea by the artifice of a colonnade engaged to the walls of the cell(182, 5).

To the rule of the rectangular plan was rarely opposed the religious architecture of Greece, and it appears not before the 4 th century was the exception in circular form; again t this was only done for edifices of small proportions. The a arrangement of a tholos -- such was the name of the round sanctuary -- borrowed its elements from the normal type and comprised three variants, distinguished by the terms apteral, peripteral and monopteral. The first, an example of which is presented by the Arsinoeion of Samothrace, is reduced to a b blind rotunda (183, 1). The second surrounds such a small s structure by a peristyle; we see it realized in the Marmaria of Delphi by the Tholos of Athena Pronaia; at Epidauros by t the Tholos of Polycletes (183, 4); at Olympia by the Philippeion (183, 3). The third only admits of a colonnade, producing a sort of lantern; the Temple of Rome and Augustus on the Athenian Acropolis consisted of a structure of that kind (183,4); The Tholos of Epidauros shows us an integral transfer of the formula for a temple on a square plan, for its interior was divided by a circular colonnade into a central area and an ambulatory.

The Treasury. -- The Telesterion. -- The Altar.

Besides the programme of the temple, Greece also proposed to religious architecture those of the treasury, the telesterion and the altar.

The plan of the treasuries, which were near the Temple of Zeus at Olympia, and at Delphi and Delos near the Sanctuaries consecrated to Apollo, did not differ from that of the temple in the first stage of its development; like that it comprised a rectangular cell and a vestibule open in front. Indeed it is necessary to see in them also storerooms annexed to the s sanctuaries near them, special chapels in which was manifested the devotion of a city by the exhibition of offerings.(163).

Because of its purpose as a place of assembly for those initiated in the mysteries, a telesterion or mystic cell could not accommodate itself to the arrangement of the temple; that of Eleusis indeed retained from the latter its rectangular a arrangement and the portico facade, but its dimensions were greater (165 × 158 ft.); access to it was facilitated by opening six doorways, two in the front and in each side; finally,

in the interior was presented a great hall bordered on each side by eight rows of steps, whose ceiling was supported by a series of 42 columns, on which rested a similar hall, termed megaron, devoted to the higher initiation.(170, 3).

The altar (bomos) on which was burned the flesh of the victims, was outside the temple, placed on the ground before the facade and on the axis of the cell; the Temple of Poseidon at Paestum offers an example of it. Sometimes it was a true monument, formed of a stepped structure above a substructure, on whose platform was performed the sacrifice and the burning of the animals; such were the great altars of Olympia, Syracuse, of Parion in the Propontis, and particularly that of Pergamus. the proportions were often considerable.[1]

Note 1. At Syracuse the base covered a rectangle 605 ft. long and 67 ft. wide; at Parion it measured a stadion (565 ft) on each side; at Pergamus a square terrace supported at 16.2 ft. above the ground an area of about 9000 sq. ft., access to which was by a broad stairway; at the middle rose the mass of the altar proper, much above the porticos surrounding it on three sides.

Frequently the ground around a sanctuary was consecrated to the deity under the name of temenos. In this case it was defined by an enclosure termed peribolos, whose inner faces were bordered by porticos, as proved by the precinct of Athena Polias at Priene, that of Aphrodite at Aphrodisias, that of Zeus at Aizani etc. Generally the gateway was monumental, f formed by a propyleion in Mycenean style (page 195); as typical examples may be cited those of the precincts of the holy places of Egina, Cape Sunion, Delos, Eleusis, Epidauros, Olympia and Priene, and particularly that affording access to t the Acropolis of Athens. The plan for a propyleion was substantially composed of two porticos placed against each other, separated by a transverse wall, in which were pierced one, t three or five openings. These vestibules were frequently unequal, that most developed being divided into three aisles by two rows of columns. At the Propyleion of Athens, the model of the kind, the gateway proper was flanked on each facade by two wings with porticos, those of the exterior projecting and the others recessed. Unfinished as it is, the edifice covers

more than 6670 sq. ft., two thirds of which are for the passage; completed, it would have occupied an area more than doubled (184, 2; 162; 218). More modest, the Propyleion of Sunion measured only 1290 sq. ft. in area, and those of Priene but 978 sq. ft.(184, 1, 3). As for the openings, they had m moderate dimensions; for the Propyleion of Athens, the principal one was 13.75 ft. wide with a height of 24.2 ft.; at Cape Sunion, the opening was equivalent to a little more than half that of the preceding; at Priene, it did not equal one third.

281 III. Funerary Programmes.

There is scarcely any sort of tomb, that Grecian architecture har not realized.

When the ground lent itself thereto, rock-cut sepulchres w were freely excavated, frequently announced by a facade in t the image of that of a temple or a house, sculptured in the rock or constructed; examples abound in Phrygia and Lycia in Asia Minor; they are numerous at Cyrene, and Syracuse presents typical examples.

The tomb beneath a tumulus was rare in Greece proper, but it was common in Macedonia, where the region of Pydna has revealed a very remarkabke one of the Hellenistic peeiod.[1] The type of the funerary mound is again found in Asia Minor. The tombs of the royal house of Commagene near Samosata, its capital, prove that it was in favor in southern Syria in the first century B. C.[2]

Note 1. Composed of a descending vaulted passage, of two vestibules of small depth, and of a chamber measuring 13.1 × 9.8 ft.

Note 2. These are indeed cones of small stones, 32.8 to 4 49.2 ft. high and 115 to 490 ft. diameter, the most important of which are flanked by two rows of colossal statues dominating high terraces, the others by three groups arranged at equal intervals, of two or three columns surmounted by statues; the whole had a grand appearance.

Tombs beneath the open sky fall into three great categories.

In Greece proper and notably at Athens, they were satisfied by indicating the place of burial by the erection of a column or a pillar, marked by an inscription or crowned by an urn; a

bust, or rather a stele, i.e. a slab set on a base; this was generally narrow and ended in an acroteria, often with an added figure in low relief; it was sometimes fashioned in the image of a facade with antes, sometimes enclosing a panel, a and sometimes an actual niche animated by the more or less p projecting sculpture of the figure of the deceased or of a funereal scene.(185).

In Lycia, the fashion was for small buildings faithfully r reproducing the appearance of the native house. The Heroon of Gjölbaschi-Trysa shows that the programme could further c comprise a reduction of the court surrounding the dwelling, with its enclosing wall; it is a species of square with 5160 sq. ft. area enclosed by a wall 19.7 ft. high and accessible by a great portal.(141).

Finally, tombs like that of Theron, so-called, at Agrigente, that of Agathemeros at Termessos in Pisidia (167), the "Tomb of the Lion" at Cnidos, the "Monument of the Nereids" at Xanthos in Lycia, and particularly the Mausoleum of Halicarnassos (186) realize a properly ornamental formula, which proceeds directly from that of the temple; a chapel surmounting a high basement, itself set on a solid with steps. At Agrigente, T Termessos and Cnidos, the proportions were relatively modest, and the appearance was that of a simple cell. On the contrary, the Tomb of Xanthos and especially that of Halacarnassos form actual edifices, with crypt in the base, above being an actual sanctuary surrounded by a peristyle [1] In brief, a tomb like the "Monument of the Nereids" is not to be distinguished from a relegious structure; on the contrary, the Mausoleum a and the "Tomb of the Lion" emphasize their purpose by a crowning in pyramidal form, surmounted by statuary, in one case being a representation of a prince and his wife on a quadriga, and in the other one of a crouching lion.

Note 1. The "Monument of the Nereids" measures in plan 32.8 × 20.6 ft. The Mausoleum occupied more than 11,840 sq. ft. and extended to about 134.4 ft. above the ground; the colonnade has nine columns on the facade and eleven on the side.

285 IV. Commemmorative Monuments.

For a monument commemmorating an event or a vow, the form preferred by the Greeks appears to have always been that of a column, sometimes quite tall, on the top of which was placed a statue, or the object which it was desired to consecrate.

Without mentianing the representations offered by the vase p paintings, numerous examples have been furnished by the Athens of the 6 th century and the precinct of Apollo at Delphi; the most notable are the columns recently retealed by the exploration of the latter place, and which support in one case a winged sphynx, in the other a tripod and a group of dancing wonen (189). Yet certain choragis monuments of Athens, -- s such as those of Lysicrates (190,; 219, 12) and of thrasyllos, -- show that an equal favorite was a type of small structure in the form of a lantern or kiosk.

286 Chapter 4. The Construction.

In the domain of construction, as in all others, Grecian a architecture did not show itself an innovator, and its contribution to the general programme of the art was reduced to t the development of conceptions and to the perfecting of systems, part of which was a heritage from the preceding Egean c civilizations, and that Egypt had invented some two thousand years earlier.

Much better equipped with tools than its venerable ancestor, and not like that devoted to the colossal; besides for reasons previously stated (pages 258-259) restricted to moderation and subjected to reason, it always made proof of conscientiousness, of method, and of knowledge, at least in monumental construction; often of refinement; sometimes of minute care. In its maturity, it endeavored and understood how to make the organs appropriate to the functions, was wisely economical of material, especially when it was marble; careful for logical construction and perfect execution; after all sufficiently c confident in its calculations to assume great risks.

It was not before the middle of the 5 th century, that closed for Grecian construction the epoch of tentatives and of frogress, at the end of a time, of a regular belief, that had passed through four great phases.

In the course of the first, which was prolonged till the 6 th century, and whose memory is preserved by monuments like the Heraion at Olympia and the Temple of Apollo at Thermos p preserve the memory, it remained in the net of the traditions of the Mycenean age. It continued to erect a wall in crude bricks, to consolidate it by wooden anchors, to protect its surface by a coating or by a wainscoting of boards, to fashion in wood all the elements of a portico, employing stone only for substructures, elsewhere in regular blocks, carefully joined with level and equal courses.

287 The 6 th century introduced construction entirely in stone, and found for the problems set by it, solutions more and more appropriate, the last of which were already very satisfactory.

Thus at about the middle of the 5 th century, Grecian construction was in possession of all the essentials of its systems and of its definite procedures.

From the 4 th century may be discerned a tendency to exaggerate economy, which may be partly explained, both by the enlargement of the programmes, and by a diminution of material resources.

Note that according as the edifice employed the Ionic or t the Doric style, the construction comprised certain variations, some of which were relatively important.

I. The Materials.

Then the classic construction was exclusively in stone, at least when it was in the service of monumental architecture. 288 Crude bricks always remained in favor for the walls of cities, because their resistance to blows of the battering ram was e esteemed superior to that of stone.[1]

Note 1. In the 4 th century, the bricks of which were built the walls of Athens, measured one foot on each side(0.94 ft); masonry of them was consolidated by inserting a wooden grillage in the mass.

There was no objection to the association of different materials in the same edifice. Thus the size of certain intercolumniations of that primitive epoch -- for example those of the Heraon of Olympia -- indicates, that at the beginning of the 6 th century wooden architraves were placed on stone columns. In the same epoch were freely introduced in a stone e-edifice parts in terra cotta; tiles, gutters, plates and coffers. In the decline of the 6 th century and in the first h half of the 5 th, a thoughtful programme -- there may be cited those of the first Temple of Athena on the Acropolis and of the Temple of Zeus at Olympia -- contemplated the execution in marble of the upper parts, those most lighted, of an e edifice in limestone. Finally, for the roofs was employed a great deal of wood.

Grecian carpentry does not appear to have surpassed the primitive phase, in which height was attained by placing timbers on each other. It was ignorant of the modery system of t the truss, which transforms the transverse load into tension.[2] 289 Thus it was massive; the dimensions of its timbers were frequently enormous, comprising sections 2.29 ft. on each side, as the case at the Arsenal of the Piraeus, for example. The specifications for the Erechtheion indicate the method of con-

consolidating the framing by the aid of cramps.

Note 2. Compare what is said of the roofing on page 312.

Grecian construction was nothing less than megalithic. The blocks of which the walls were made were of more modest dimensonss; their lengths rarely exceed 4.88 ft., widths 2.44 ft., and heights 2.6 ft., and they rather kept to the corresponding dimensions of about 3.66, 1.5c and 1.37 ft.[1] Even for the stones of substructures, the lengths remained below 7.6 ft.

Note 1. Here are some dimensions of the blocks.

Selinonte,	4.55 long,	3.66 wide and	1.83 ft. high.
Parthenon,	3.71 long,	1.57 wide and	1.83 ft. high.
Theseion,	3.75 long,	1.56 wide and	1.83 ft. high.
Erechtheion,	3.94 long,	3.96 wide and	1.48 ft. high.
Arsenal,	3.76 long,	2.65 wide and	1.41 ft. high.

Yet the Grecian quarryman knew how to cut monoliths of grand dimensions. Without mentioning those forming the shafts of the first Artemesion at Ephesus, and which measured some 55 ft., it was not rare for cylinders 21.4 to 24.4 ft. high to be quarried with a width of about one fourth, and beams 12.2 to 13.7 ft. long. They were not embarrassed by cutting those attaining 19.8 ft. (north portico of Erechtheion), 20.0 ft. (Olympeion of Athens), or 20.2 ft.(older portions of the Temple of Apollo at Selinonte).

The stonecutting was the object of the most minute care. (191). They dressed the joint surfaces to perfection, but l left on those intended to be seen a covering of the material, which the facing should remove after the completion of the c construction. They only took the precaution to establish guides for the final surface; for a block in course, this was a draft along the edge with a width of an inch or so; for the shaft of a column, it was the beginning of the flutes at the two ends of the trunk, if this was a monolith, and in the case of a pile of drums, this was at the top of the upper one and the bottom of the lower one. On the other hand, the capitals were always set finished.

With a view of economising as much as possible the labor o of the stonecutter, the ingenious minds of the Greeks early suggested to them an idea, but which they did not apply before the 5 th century; that the reducing the flat surfaces of

two beds by two corresponding recesses.(192). Then the panel was slightly hollowed, only leaving in case it was rectangular a border 2 3/8 to 3 1/8 ins. wide, and where it was the bed plane of the drum of a column, the circular border had an area averaging a little more than half the total extent.[1] (192).

Note 1. Parthenon, upper drum; radius 32 3\4 ins., width of border 9 1\2 ins; Propyleion, radius of drum 17 1\2 ins., width of border 5 1\8 ins.

On the other hand, the Greeks did not hesitate to complicate the operation of cutting by methods required by a desire to facilitate in the greatest measure possible, the hoisting and setting of the blocks (193). Thus on the cylindrical surface of a drum, at the ends of two crosse diameters were left tenons, which were caught in the loops of the ropes. If it referred to a prismatic course block, the same procedure occurred on the face and back; or indeed grooves in U-shape were sunk on the end joints, that afforded a hold for the ropes, and from which they were easily drawn after setting. If the stones were of small dimensions, holes were cut from the upper bed, in which was placed a lewis.

II. The Methods.

If we except private building, which betrays negligence,[2] Grecian construction is distinguished by a rare quality of j jointingl particularly in the 5 th century, and when it employed marble.

Note 2. Thus the walls of the houses of Delos were made of two independent faces of rubble set dry and filled between w with small stones; they combine materials of unequal resistance.

The Wall.

In the 6 th and 5 th centuries, the wall is homogeneous; in the 4 th, it tends toward a composite structure of a filling between two jointed facings; such, for example, is it at the Temple of Apollo at Didyma, where two marble facings mask a filling of rubble.

Excepting for retaining walls,[3] for which it is proper on account of its stability, Grecian construction very rarely e employs polygonal masonry, which it elsewhere executed in a very regular and careful fashion.

Note 3. Compare at Delphi, for example, the retaining wall of the terrace supporting the Temple of Apollo.(194, 2).

However Asia Minor offers examples of its methodical combination with the rectangular; thus at Cnidos is observed the superposition on seven courses of rectangular blocks, of a p portion of polygonal masonry, with a coping similar to the b base (194, 8).

Normally, the elevation of a Hellenic wall is divided tnto three parts (195); below extends a plinth, composed of one or rather of two courses of stones set flat; above is a high base consisting of two slabs set on edge and generally separated by a space, this base being termed "orthostae" and recalling the memory of the stone facings protecting the lower zone of a wall of crude bricks, revealed to us by the Mesopotamian and Hittite architectural styles, and that were also the fashion in Crete; [1] to complete it, blocks of medium size were 1 laid on this, placed on their quarry beds. The orthostate s slightly projected beyond the wall proper, and the base beyond the orthostate.

Note 1. See pages 133, 156 and 292. The height of the orthostate was at the Parthenon 3.56 ft., at the Erechtheion 2 2.98 ft., and at the Theseion 2.70 ft.

In all careful building the beds were rigorously level and all courses were equal or nearly so. Rarely [2] were employed the arrangement of an alternation at regular intervals of courses of two different heights. Almost always the blocks of the same course all appear in the same sense, which is that of their longer axis; it is necessary to come down to the late epoch to observe, as possible on the Temple of Labranda, a succession of long and short faces (194, 6). Sometimes the thicknesscof the wall is formed of a single block. More frequently were inserted between two courses of large square blocks one of two long stones set beside each other, which were not jointed together, when the use of marble incited to economy, as the case at the Parthenon. In all cases, pains were taken to break joints, and to have all those of the same course fall safely on, or at least about the middle of the blocks of the course beneath. The joining of the two courses at right angles was by square blocks; in the 4 th century appear-

appeared the best arrangement, called L-shaped. 3

Note 2. There may be cited as examples the eastern and western walls of the great Altar of Pergamus, and the Monument of Agrippa at Athens.

Note 3. It was employed at the Erechtheion in the portion constructed at the beginning of the 4 th century, and at the Arsenal of the Piraeus.

By a well understood economy permitted by the quality of t the execution, the Greeks reduced the thickness of the walls to strict necessity. It further varied according to whether the style of the edifice was Doric or Ionic, on the whole bein the first case equivalent to one-ninth the height of the front, and in the second to one-eleventh; but it was susceptible of a proportion diminishing to the tenth and thirteenth part. For an edifice of small height, its amount was often less than 3.28 ft.; for those of medium dimensions, it was about 6.56 ft., and for those very large, it approached 9.15 ft. It is very remarkable, that while constant at all heights of a wall of an Ionic or Corinthian monument, it diminished from base to summit, though indeed in a scarcely perceptible manner, when the construction was according to the Doric mode.

294 We may cite the retaining walls of the terrace beneath the Olympeion of Athens as an example of the use of the buttress, that Grecian construction knew how to make for the reinforcement of a wall (194, 9). These are regularly spaced 17.4 ft. apart as pilasters 2.68 ft. wide and projecting 3.28 ft, some abutting against the surface of the wall, others being bonded into its mass.

295 For the Greeks the normal type of the door and the window was the opening beneath a lintel, the outline being either a rectangle or a trapezoid (196; 262). Generally the sides were composed of two jambs, either monoliths or built, the sill for a window being a block similar to that serving for a lintel. The lintel and the sill frequently extended beyond the jambs and were built into the body of the wall; (196; 11, 12); only by the search for appearance may be explained a method so subject to criticism from the structural point of view, s since as a result of unequal settlement of the building and the frame, it created for the latter a risk of fractuee.

The gates and posterns of cities were frequently nothing

more than a hole, for constructing which was ordinarily employed the system of corbelled courses; the shape was sometimes the very elementary one of a triangle (196,1); sometimes that of this figure or of a trapezoid above a rectangle; or again that of a pointed or round arch (196,2,5,8). The mode of spanning it by a voussoir arch is rare, except in Asia Minor and especially in Acarnania (196,9,10); the geographical situation of the last country in relation to Etruria leads to an interesting and suggestive comparison.

The Isolated Support.

Whether its form was Doric or Ionic, its height was a little more than 21.4 ft., as at the Temple of Corinth, or about 55 ft., as at Ephesus, the isolated support was at first entirely monolithic, like the wooden post replaced by it. This method of construction was never excluded, at least in regard to supports of small height; yet from the 6 th century became general the system of a pile of drums.(195).

At first restrained by the prudence of the constructor, the number of these "vertebres" -- to use the expressive language of the Greeks -- increased later.[1]

Note 1. If there be taken as a term of comparison what is found at Temple C of Selinonte, and which is four or five for a total height of 26.2 ft., it is perceived that the subdivision of the shaft at the Parthenon is 2 1\3 times greater, at the Theseion 2 1\2 times, at the Temple of Segeste nearly 2 4\5 times; even for colossal columns, like those of the Olympeion of Athens or of the Didymeion, it is respectively 1 2\3 and 1 4\5 times greater. (Selinonte, Temple C, height 26.2 ft. = 4 to 5 drums; Parthenon, height 31.7 ft. = 10 to 12 drums; Theseion, height 16.8 ft. = 7 drums; Segeste, height 28.6 ft. = 10 to 13 drums; Olympeion of Athens, height 52.5 ft. = 18 drums). As an example of extreme thickness may be cited that of the drums imperfectly detached from the benches of the quarry of Selinonte, called the Cave di Compobello; t this extends to from 9.45 to 10.0 ft.

Further, it was not equal for all units of the same series of supports.[2] The Greeks were too wise and had too many reasons for being economical to assume that an appearance of regularity, -- often difficult to perceive and even invisible,

when the construction was of limestone and the shaft was masked by a covering of stucco -- was worth the loss of material necessary to pay for it.

Note 2. At the Parthenon, the height of the drums varies from 2.68 to 2.90 ft.; at the Temple of Zeus at Olympia, from 1.71 to 2.35 ft.; at Segeste, from 2.84 to 3.84 ft.

This tendency to diminish the massiveness is still more striking, when the support is observed in regard to its proportions. At first its strength is exaggerated; the classical epoch was even forced to establish a more just relation between its width and the work to be done; finally, the Hellenisic epoch inclined to slenderness. Thus while the Ionic support of the 6 th century was equivalent to a little more than 7 diameters, almost 10 are counted in some dating from the second half of the 5 th century (233). Particularly in the construction after the Doric mode is the evolution manifest; the most ancient columns are stumpy, their height being scarcely more than four diameters, measured at the base; those p produced in the 5 th century are more slender with heights to equal five or six diameters; finally from the beginning of t 4 th century it progressed until the reduction of the diameter to nearly one-tenth of the height (223). Hellenistic architecture even risked audacious proportions; thus at the Arsenal of the Piraeus, the diameter of the pillars did not exceed one-eleventh of their height.

In regard to the cutting of the capital and the base, different systems are observed according to whether one considers the Doric or the Ionic mode.

In all periods, the first comprises the form in a single block, not only all the elements of the capital, but also the part of the shaft immediately beneath. The construction according to the Ionic formula follows two ways; sometimes,[1] it cut separately the part beneath the beam and the echinus or cushion part, the last being realized by an enlargement of t the top of the shaft; more frequently, with the purpose of e economizing the waste of material and the labor required for relieving the bed of the echinus, this and a portion of the shaft was comprised in the same mass as the abacus.[2]

Note 1. In this manner was it done at the Temple of Samos

and at the north portico of the Erechtheion.

Note 2. Thus at the Propyleion, at the eastern portico of the Erechtheion, at Phigalia and at Sardes.

It did the same for the base; -- sometimes -- for example, this was the case at the Heraon of Samos and at the north portico of the Erechtheion -- it required for one part a block furnishing the base, and for another it placed a broad footing on the shaft. But for some reasons given by us in reference to the capital, from the 5 th century it preferred a distinction of the base from the shaft, that permitted the reduction of the foot of the latter to the proportions of a narrow and low projection.

277 For the Ionic column a vertical position was the rule. But in several Doric edifices, in the number of which figure the masterpieces of the kind, the isolated supports are not vertical. At first, all are uniformly inclined toward the wall of the cell opposite them; those of the angles belonging to two facades, their inclination is a resultant,and their direction is in the diagonal of the plan (198,1,3). Estimated at the level of the ground, the variation from a plumb line is a minimum, scarcely perceptible to the untrained eye, but it may actually be equal to 1 1/2 ins. at the Temple of Paestum and at Egina, and to 2 3/4 ins. at the Parthenon. Besides, at the Parthenon and at the Theseion, the inclination towards the interior just mentioned is complicated for the columns of the facades by an inclination toward the middle of the row.((198,2). Economical and most ingenious, the Greeks reduced to the minimum the complications, that these peculiarities must introduce in the formation of the drums. They restricted themselves to giving the necessary slope to the upper bed of the lower and to the lower bed of the upper one, all the others remaining as cylinders perpendicular to the parallel planes, perpendicular to the axis (195,A).

To a row of isolated supports the Greeks ensured the firm bearing of a course of large slabs, that projected a little sidewise beyond the bases, and which bore the significant name of "column supports" (stylobate).(195,A; 202,3,4). That element, like all those previously considered by us, was affected by the evolution progressively reducing the massiveness

the primitive Hellenic construction. At first were employed long monoliths, each of which supported several columns; then, as attested by Temple C of Selinonte, for example, -- they r risked the fracture of a slab in the intercolumniation, the joints corresponding to the middle of the bases of the columns; the classical epoch preferred an arrangement of three squares per unit of interval, one beneath each support and the third between them; finally, the Hellenistic age even passed to a division into four slabs.

The Entablature.

Architrave. -- To span an intercolumniation the Greeks only employed the system of the straight beam, realized by means of stone beams connecting each support with the next, just l like wooden timbers. [1]

Note 1. To the course of these architraves was applied the name of epistyle (above the colonnade).

300 The desire of economizing the labor of the carrier and the setter, and also that of increasing the chances for stability by a division of the work imposed on this member, determined an evolution in its structure analagous to that observed in regard to the isolated support. At first, as proved by the Temple of Corinth, it was made of a single block; it was then composed of two or three; or indeed these were superposed -- this was the first solution (199,C,E) -- or rather as more j judicious, and which only became the normal arrangement, they were placed on edge and beside each other, relieved on their joint surfaces. [1] (199,A,B,D). For a large edifice, the length of these beams varied as an average between 13.8 and 14.8 ft., with a height of 3.28 to 4.92 ft. and a thickness of 1. 1.64 to 2.62 ft. [2]; in case of central intercolumniations or of colossal programmes, it might quite commonly reach from 1 16.4 to 18.1 ft., exceptionally exceeding 21.3 ft. [3]

Note 1. Doubled by superposition:-- archaic Temple of Metaponte; Temple C of Selinonte.

Tripled by superposition:-- Temple of Zeus at Agrigente.

Doubled side by side:-- Temple of Egina; Propyleion and Olympeion of Athens (the extremes of each facade); Temple of P Poseidon at Paestum.

Tripled side by side:-- Temple of Zeus at Olympia; Parthen-

Parthenon, Olympeion of Athens.

Note 2. For those of intercolumniations, see Chapter 6. p Pages 338, 350.

Note 3. Parthenon, 14.0 ft. long, 4.4 ft. high, 1.8 to 2.13 ft. wide.

Temple of Poseidon, Paestum, 14.75 ft. long, 4.92 ft. high, 2.4 ft. wide.

Propyleion at Athens, 17.8 ft. long, 3.77 high, 2.36 ft. wide.

Olympeion of Athens, 21.5 ft. long, 3.38 ft. wide.

The bending stress imposed thereon may be appreciated by n noting that the pair of beams forming the middle architrave of the Propyleion of Athens -- actually supported at each end for a length of 2.0 ft. by the capital of the support -- supported on a total area of 101.0 sq. ft.(17.8 × 5.65 ft.) a l load of about 95.5 tons, the cross section measuring 5.06 sq.ft.

At the angles of a colonnade, the architraves were sometimes joined by contact, sometimes by partial intersection. If they were doubled, those of the lower series were butted and mitred.(203,3).

301 Frieze. -- When the elevation of an Ionic monument comprised a frieze, that was composed of a series of blocks. On the lontrary, the Doric frieze was subdivided, sometimes extremely so; otherwise the construction varied according to the edifices. In a general way, it was divided lengthwise into two faces, the external exposing an alternation of projections and recesses termed triglyphs and metopes, [1] the internal having a continuous surface. When the construction was in l limestone, these adjoined each other (199,B); if it was in m
302 marbel, to econamize the material and lessen the load on the architrave, their thickness was reduced, so that between them extended a kind of space, whose width is from 8 to 14 ins. at the Parthenon (199,A). The mode of construction of the outer face varied greatly. Ordinarily it was composed of a single course; yet examples exist -- and one of these is presented by one of the masterpieces of Hellenic architecture, the Temple of Poseidon at Paestum -- of a facing in two courses. [2] As for the longitudinal arrangement, two systems competed; o one restricted the number of blocks and simulated in the cutting the theoretical independence of the triglyphs and metopes;

the other [3] -- which was imposed when the latter were sculptured, having the advantage of setting them separately after finishing their ornamentation -- formed a series of prisms a and alternating slabs; these were connected to the triglyphs by inserting their edges into grooves cut in the sides of the triglyphs. [4] (203,2). Sometimes, as the case of the Parthenon, at some distance behind the metope was set a block of the same height to strengthen it.

Note 1. For the arrangement of the sculpture of the frieze, see the Chapter relating to the Effect, page 344.

Note 2. Note that this refers to the occurrence of monuments in limestone, where the masonry was masked by stucco.

Note 3. As an ancient example may be cited the "Basilica" at Paestum, where the independence of the triglyphs is attested by their disappearance.

Note 4. At the Parthenon, the grooves are 6 ins. wide and 1 1\4 ins. deep.

Indeed this diversified and measurable dispersed arrangement, as it might be termed, of the elements of the Doric frieze was consodilated by the weight of the cornice, which the Greeks expressively denominated the crown.(Geison).

Cornice. -- Although the climates of Grecian countries are not damp, Hellenic architecture multiplied precautions f for protecting its facades from the flow of water shed by the roofs. A first one was to project the cornice strongly beyond the face of the frieze; [1] a second, not observed by construction according to the Ionic method, was to provide the outer face with one or more deep grooves suited to catch the d drops; the third consisted in giving the lower plane a pronoounced inclination toward the exterior, arranging a beak profile to throw off the water (201).

Note 1. The overhang at the Propyleion is 1.33 ft.; at the north portico of the Erechtheion being 1.14 ft.

303 The cornice was normally composed of a single course of thin slabs balanced on the front and rear faces of the frieze and sometimes projecting one-third of their length. On the eastern and western faces, whose pediments were filled with statues, the danger of breakage resulting from such a projection was increased by the fact of a considerable load. This

danger was prepared for by loading the rear of the cornice o over the columns by two weights; first about the middle by t that of the wall serving as a background for the sculpture, and which sometimes -- as on the Parthenon, the Theseion and the Temple of Egina -- consisted of slabs set vertically, sometimes of a wall erected in courses; then by a pile of blocks, bonded to the wall or not.(199,A,B).

Note 1. At the Propyleion, the thickness varies from 0.92 to 1.20 ft.

On these two facings rested the raking cornice of the pediment, which was a repetition of that of the entablature. The danger for it was the sliding of its parts; this did not frighten the Grecian constructor, who limited himself to strongly clamping the slabs to their support.(Page 306). The test of time has not proved him to be in error.

If a Doric colonnade was inclined toward the interior of t the edifice, the same slant affected the architrave, the fireze and cornice above it, though in less degree; thus at the Parthenon, the variation from the vertical is 2 3/4 ins. for the columns, but is only 13/16 in. for the entablature. Inversely the Ionic mode freely inclined the upper parts forward. (201,8). [2]

On these points, see further Chapter 5, III, page 327.

The Methods for **Consolidation.**

For a Grecian structure, the general conditions of stability were quite analagous to those found in an Egyptian construction. In both was the great advantage of the absence of l lateral thrusts, resulting from the exclusive use of the architrave for the supported portions of the edifice. Likewise in both, one should mistrust the ground, weakened on the banks of the Nile by infiltration, and exposed to earthquakes in the area of Hellenic civilization. Yet while in Egypt protection was facilitated by the massiveness of the walls and the supports, it was opposed in Greece by the slenderness of both.

A. Foundations. -- The Greeks devoted more care to foundations than the Egyptians. In a general way, they desired a safe bearing, as much as possible that of the rock, and they carried the substructure down as far as necessary. On this point as on all others, their practice was rational, in a accord both with the logical turn of their temperament and w

with the necessity of economizing effort found by them. Almost always, they did not uniformly excavate the entire extent to be occupied by an edifice, but merely the bad or doubtful portions. [1] In the case of a damp site, the Greeks commenced by establishing a pavement; that supporting the Artemesion of Ephesus was composed of a bed of charcoal about 2 3/4 ins. t thick placed between two layers of mortar. Let us add that frequently the foundation, properly so called, was strictly localized beneath the walls and columns, the intervals being merely filled; they were even inclined to content themselves with a rough mass of boulders or small stones connected by m mud mortar. [2](203,3). It is proper to regard as a second foundation beneath the open sky the mass of the stylobate, the actual base of the temple (202,4).

Note 1. Thus at the Heraion of Olympia; toward the east, where the soil is sound, the masonry underlying the edifice is reduced in height to a single course; it measures 8.5 ft. toward the west, where the ground is pebbles and alluvium. Likewise at the Parthenon; the northeast angle of the substructure rests directly on the rock, while under that of the southwest, the substructure was extended to a depth of 35.3 ft.

Note 2. Exception should be made for the Parthenon, whose substructure is massive and is made of dressed stones. In a fragment of the specifications for the foundations of a Temple on the island of Lesbos, published by Choisy (Etudes, p. 228), it is stipulated:-- "If there are soft places in the g ground intended to receive the foundation, the contractor shall clear it away to give place to a larger stone."

Bonding of the Materials. -- Yet in the judgement of the Greek constructor, nothing equaled a strict bonding of the m materials. Like his predecessors in Egypt, he did not demand this from the adhesive power of the mortar; he preferred to obtain it by realizing the three causes of adherence, constituted in the first place by a contact of the joined blocks as absolute as possible; in the second their union by framing; in the third being their connection by clamps.

The success of the first of there means has for conditions two perfections in the cutting of the stones and in their setting. We have previously noted [2] the minute care given to b

both these operations by the Greeks. (Pages 289 - 191). The results obtained were magnificent, whenever the programmes c comprised sufficient resources; at the Parthenon, the blocks composing the substructure of the edifice are so perfectly a adjusted, that even today one frequently has some difficulty to perceive the joints.

The second system was freely used by the Greeks and consisted in the application to stone of methods suited for carpentry and even joinery, such as housing by tongues and grooves, joining by tenons and mortises, fastening by cross-beams bent at their ends.(203).

Finally, nothing is more characteristic of Grecian construction than its procedure, -- notable in all epochs but especially starting from the classical -- of ensuring the adherence of the elements of the building by the use on a large scale, of various clamps, striving to preserve the relative positions of two superposed courses, and others the contact of two adjacent blocks. The former were usually prismatic or cylindrical joggles extending halfway into each of the two adjoining stones.(204,1-4,6). They were sometimes made of hard wood, ash or olive, that was sometimes coated with pitch, but more frequently of iron and exceptionally of bronze. Their use was very particularly indicated for the slabs of the raking cornices of the pediments, exposed to sliding, and for the d drums of columns in countries subject to earthquakes, which ran the twofold risk of lateral displacements and of rotation, that would have dertroyed the correspondende of the flutes. This danger was provided against by cutting at the centres of the two beds holes of rectangular section, in which was inserted a block of wood or of metal serving as an axis, and prevented from rotation by its shape (204,9,11), or better still, as at the Olympeion of Athens, for example, by arranging two or four of these dowells.(204,10). It is remarkable, that t the lower drum of a Doric column was hardly ever clambed to the stylobate. [2]

Note 1. That was the mode in Sicily and also for the columns of the Parthenon.

Note 2. An exception may be cited in the columns of the T Temple of Herakles at Agrigente and those of the Temple of A Athene at Pergamus.

The cramps, of which Grecian construction was not sparing, were of various shapes, either dovetail, I or even Z (204,5,8). Like the tenons, they were set in lead, both to fix them f firmly in their places and to protect them from oxidation. W When it concerned the junction of two courses, the ordinary method consisted in fixing the joggle in the bottom bed of t the upper course, and after the setting was finished, melted metal was run in by a narrow channel cut in the bed of the l lower block.(204,1,2,3). The sketch X of Fig. 204 indicates the procedure for a column.

The Pavement.

For the pavement, three systems were in competition. Sometimes it was a floor of slabs with areas measuring 10.8 to 16.2 sq. ft. and a thickness of 8 to 10 ins., either set on the m mass of the substructure, or more rarely on a grillage of blocks, [1] an example of which is offered by the Temple of Phigalia.(202,4). Quite frequently -- thus at the Temple of Zeus at Olympia, and it was the fashion for houses -- a mosaic set in mortar, either arranged with pebbles, or in the Hellenistic epoch with cubes of marble. Sometimes, as shown by the T Temple of Ægina, an area was composed of stucco. As for the floors at considerable height above the ground, they were realized by means of a series of large beams fixed in the walls or borne by supports, with transverse joints and planks.

Note 1. At the Parthenon, the slabs measure 3.9 x 5.7 ft., and their thickness is 8 1\4 ins.

The Methods of Covering.

What is known of Grecian coverings announces an ingenious solution of this problem of construction, logical, simple, p practical and original in large measure.(206; 207; 208).

Sometimes, as attested by the specifications of the Erechtheion and the fact, that certain remaining tiles are decorated on the lower surfaces, the edifice received only a roof, visible from the interior; sometimes, on the contrary, the r roof was masked by a ceiling.

In a monument with a peristyle, the portico,in regard to c construction was entirely independent from the cell, that it surrounded. Yet the roof was common to both, and viewed from the exterior, it presented the appearance of a canopy suppor-

supported by a colonnade.

Ceiling. -- The construction of the Grecian ceiling permitted its execution in stone as well as in wood; the latter comprised the use of precious species, such as cedar and cypress, and was the rule, excepting for covering the porticos of elegant edifices of the classical and the succeeding periods, for which were preferred stone as a material.

Then there was a choice between several methods of construction.

A first offered the advantage of being utilized, even for a wide span, and had as an essential element a series of beams, called girders, placed over the space to be covered, according to its samller axis and at equal intervals. [1] (206,1-4). To enclose the intermediate spaces, two systems were in competition. For example, one was applied to the eastern and western porticos of the Parthenon, to the southern porch of the Erechtheion, and to the entire portico around the Temple of Phigalia, merely slabs being employed.(206,164). The other was adopted for the covering of the Erechtheion, and placed transverse beams on the girders to form a grille. The rectangular bays thus formed were closed according to the arrangement of the "coffer", either directly by means of a slab, which sometimes was of terra cotta (206,3), or with two recesses, first by a reduction of the opening by a series of gradually smaller frames, then by placing a slab.(206,5).

Note 1. At the Parthenon, their length was 14.3 ft. with a breadth of 3.7 ft. and a height of 1.77 to 1.97 ft.

A second type of ceiling -- it was chosen for the side porticos of the Parthenon, for example, -- was only suitable for openings of small dimensions, for it consisted only of a course of slabs.(206;3,4).

In any case, like the slabs of the coffers, these were reduced in weight as much as possible by sculpturing their lower plane and by roughing off their upper surface.

Main beams, cross beams and panels, whether the material w was stone or wood, were fitted together by tenons and mortises; as for the slabs and the coffers, their edges rested in a rebate formed in the tops of the grillage of supporting frames.(203,1; 206,3,5).

Vault. -- In the present state of knowledge, it may be
stated that in Hellenic countries, the solution of the probl-
em of covering by the use of the vault was still more except-
ional, than that of spanning an opening by the expedient of
the radial arch. It is merely that Greece proper offers as
very rare applications of slabs inclined against each other
above a rectangular opening, as at the archaic Temple on Mt.
Cynthos on Delos, or as a pyramid over a polygonal interior,
3// as at the "Tower of Winds" at Athens.(207,1,2). It is neces-
sary to pass into Asia Minor and at least to come down to the
2nd century B. C. to find at Pergamus a species of tunnel va-
ult, whose execution still betrays timidity, and another of
a cross vault by the incomplete intersection of two tunnel
vaults at the same level. [1] (207,3).

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Roof. -- In spite of an extreme scarcity of monumental
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3/3 in its course between the pediments, was furnished by cross beams resting either on the walls or on the entablatures of the internal colonnade. The use of rigid woods of resinous species permitted spans of more than 50 ft. [1]; now with the exception of colossal edifices, like the Temple of Apollo at Selinonte, it was necessary for the width of the inteeior or of the aisles to attain that dimension. [2] On the ridge at one end and at the other on the longitudinal walls, rested inclined rafters upon which was laid the covering of tiles. These rafters were supported at one point of their length, when the plan of the cell comprised two rows of isolated suppports, a and by the wall of the sanctuary, when the edifice was flanked by porticos (208,3,5,6). Prudently were employed timbers of very great dimensions; at the Temple of Poseidon at Paestum, the rafters measured 8 3/4 ins. square and the gains for the great beams announce sections of 2.0 × 2.36 ft., and which elsewhere the specifications of the Arsenal at the Piraeus fixed at 2.46 ft.!

Note 1. Tie-beams of the Cathedral of Messina = 49.3 ft.; of that of Monreale = 47.0 ft.

Note 2. Middle aisle of the Parthenon = 32.2 ft.

The covering of the roof leads to the same observations as the cornice; like that, it forms an organ perfectly adapted
3/4 to its function, perfected to the least details, to a point, that the precautions manifested by it are found rather excessive, with regard to the dryness of the climate. It was early made of tiles. These were sometimes placed directly on t the framework of carpentry, sometimes a covering of boards was interposed, or again -- as we learn from the specifications for the Arsenal of the Piraeus -- is the arrangement of a sheathing of boards and a filling of earth, very suitable to prevent the heating of the carpentry.(208,2).

The tiles were at first in the form of flattened half cylinders (209,1), then being large and thin plates with edges turned up. [1] From the ridge each row lapped over the one next below, so as to prevent leakage; on the upper edge of each p plate was even made a ridge as an obstacle to the ascent of the water by the wind or by capillarity. The joined edges were held by semicircular or triangular cover tiles, superp-

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superposed in the same manner. It was not the same for the upper rows on both sides of the ridge.(209). Minute precautions were taken to prevent water from running down over the facades. Along the rake of the pediment the end tiles were raised to form a border termed a cyma, that compelled the water to descend to an outlet spout.(209,4; 199,A,B; 205; 255; 257). As for the last row of each slope, sometimes -- it was so at the Parthenon, Theseion, Temple of Phigalia and Temple of Egina -- it projected slightly beyond the cornice; sometimes, as the fashion in Sicily, it rested on a gutter furnished with spouts,made of terracotta and later of limestone. (255; 156; 257).

Note 1. These dimensions varied; for a length from 2.62 to 3.61 ft., for a width from 1.31 to 1.64 ft., with an average thickness of 1 5\8 inch.

From the first half of the 6 th century, the terra cotta t tiles were competed with by those in marble, the honor of the invention of these being given by the ancients to a certain Byzes of Naxos; from the beginning of the 5 th century their use was intended for every careful programme. [2]

Note 2. The tiles of the Parthenon were 2.52 ft. long, 2.21 ft. wide,and 1 5\8 ins. thick at the middle and 2 3\8 at the edges. The cover tiles of the same length were 9 1\2 ins. w wide, hollowed out to half their thickness, and to facilitate covering, the edges of the tile and the border on which they wereset were left slightly rough. So many proofs of the conscientiousness and ingenuity of the Hellenic constructor!

III. Was the Structural System of the Greeks one of Carpentry in Stone?

Ionic or Doric, the Grecian portico might be conceived as 3/5 a free translation into stone of an original system of carpentry, i.e., of a combination of trunks and posts for the isolated supports, of longitudinal and transverse beams for the covering, of small beams designed to provide a transition between the smallness of the bearing surfaces and the greatness of the surfaces supported.(210).

The hypothesis is based on the authority of the ancients a and on the fact, that the primitive colonnades were in wood, and that the spacing of the supports of certain ancient peri-

peristyles presupposes architraves of that material.

Yet we have seen that it is no less than indispensable for the explanation of the structural system of Hellenic architecture.

Chapter 5. The Effect.

1. Effects of a Monumental Order.

In all parts of its area and at all epochs of its history, Grecian architecture attached at least as much importance to the qualities of appearance as to those of fitness and of construction.

Not only did it passionately follow the best shapes of the mass and of the members of the edifice; but again there exists no kind of monumental decoration of which it has not made use. This definition always comprises some distinctions; the love of effect was always more vivid among the Ionians than with the Dorians; it was more developed after than before t the change from the 5 th to the 4 th century, and Hellenism in its decline passed into excess; to the Attic school of the second half of the 5 th century belongs the palm of taste.

Considered in its higher manifestations, even in the entirety of its works, Grecian architecture appears in regard to m monumental expression, to have made more of what is refined and harmonious, than of what is powerful and contrasted.

I. Effects of Picturesque or Affective Order.

Indeed it seems, that even if they had not been forbidden by the social and economic conditions of their production, (page 258), the effects resulting from material greatness would not have obtained favor, particularly when it proceeded according to the Dorian ideal. Its most ample programmes -- in regard to the temple, they did not exceed a half dozen -- were anything but colossal. The most ambitious, that of the Olympeion at Agrigente, did not require it to occupy more than about 67,800 sq. ft. in area, nor to have a height of more than 118 ft. above its base. The platform supporting the Parthenon, the national monument of an ardent people, grandly c conceived and without limitation of resources, covers only about 23,100 sq. ft., and the edifice does not raise its ridge higher than 57.5 ft. More than three of its size might be p placed on the area of a Gothic cathedral like that of Amiens. (211,A). As for temples of average dimensions, they were properly small structures. [2] Finally the category of very small buildings was numerous, on the scale of the Temple of Athena Nike, whose facade did not exceed 18.0 ft. and whose cell oc-

occupied less than 172 sq. ft.! A classification of the lengths of the facades of temples reveals the taste of the Grecian architects for certain dimensions, otherwise determined up to a certain point by the requirements of composition and by those of the construction of porticos with architraves; a series passing from 62.2 to 78.7 ft. includes most of the great edifices; another with limits of 32.8 and 49.2 groups a good number of monuments of average proportions;[3] Finally, around 164.0 ft. vary the colossal facades.(212)[4] And no artifice intervenes to create the illusion of greatness without the r reality; it is at most in this order of ideas, that we can p point out the endeavor for an appearance of depth, in the case of a colonnade in two rows, by means of reducing the diameter of the columns of the second row, and likewise sometmies by a reduction of their height, as at the Parthenon.

Note 1. The Heraon of Samos (Ionic) covered about 64,500 sq. ft.; the Temple of Apollo (G.T.) at Selinonte (Doric), 59,150; the Didymeion (Ionian), 58,000; the Artemesion, of Ephesus (ionic), 56,000; the Olympeion of Athens, founded with a view of execution in the Doric mode, realized in the Corinthian, 47,400 sq. ft.

Note 2. That of Aphaia at Egina, which may be taken as the type, was 44.8 ft. wide, 94.0 long, and a little over 31.2 ft. high; its sanctuary did not exceed an area of 775 sq. ft., a and its middle aisle measured no more than 10.72 ft. in width.

Note 3. 62.4 ft., Heraon of Olympia; 62.4 ft., Aphrodision at Aphrodisias; 64.0 ft., first Temple of Acropolis, Athens; 69.0 ft., Temple of Corinth; 75.5 ft., Temple at Segeste; 77.3 ft., Temple D, Selinonte; 78.7 ft., Basilica, Paestum; 78.7 ft., Temple C, Selinonte; 78.7 ft., Temple S, Selinonte.

Note 4. 34.6 ft., Metroon at Olympia; 36.1 ft., portico of Erechtheion; 39.0 ft., Asklepion of Epidauros; 43.2 ft., Temple on Cape Sunion; 44.3 ft., Theseion; 44.8 ft., Temple on Egina; 46.0 ft., Temple, Assos; 47.0 ft., Temple, Phigalia; 47.2 ft., Temple of Demeter, Paestum.

III. Effects of Monumental Relief.

No more than it desired to strike with stupor, did Hellenic
319 architecture aim to act on the imagination or feeling, to ex-
320 cite curiosity by a novelty or originality, and to entertain

it by variety. An examination of the general relief of the Grecian monuments reveals that it was always very simple, exclusive of movements of the mass, accidental outlines, effects of height, prespective or of light and shade. It was singularly uniform and monotonous. For all edifices having the same purpose, the general conformation was similar. For all those of the same style, the arrangement was constant, whatever the dimensions; great or little, a temple facade comprised exactly the same elements. Finally, in the matter of architectural composition, Hellenic invention was reduced in the course of a career of eight or nine centuries to two variations on a single theme; two modes of elevations for a portico, the Doric and the Ionic. The proportioning in various dimensions of the generatrices of the same sort of surfaces or of the same species of masses varied only within quite narrow l limits. Always Grecian esthetics never admitted the necessity of a fixed ratio between two dimensions comparable together, and the artistic diversity of the Hellenic world as well as its historical evolution found itself reflected by variations peculiar on the one hand to Sicily, Greece and Asia Minor; on the other to the archaic times, to the classical age, and to the Hellenistic epoch.

The rectangular outline of the plan is the rule, and it appears more or less elongated for similar widths and according to the edifice, and up to a certain point, according to epochs and styles. An inventory of the monuments arranged from this point of view reveals the possibliity of a relative classification. A first category is composed of archaic temples, whose principal axis is between 2 2/3 and 3 times the smaller one; [1] a second comprises the productions of the classical a age, numerous and most important, [2] the ratio of the facade to the side varying between 1 to 2 1/4 and 1 to 2 2/3; a third is characterized by the fact, that the longer dimension contains from 2 to 2 1/4 times the smaller, grouping together
321 small Doric monuments of the 4 th century, [3] colossal structures of the 5 th as well as of the 6 th century, [4] and some of the best qualified representatives of the primitive and t the Hellenistic Ionic style; [5] finally a fourth consists of the Ionic and Corinthian edefices, whose side is less than

twice the facade, until it is measured by 1 1/2 times the latter.[6]

Note 1. See the Temples of Selinonte, that of Artemis at Syracuse, and the Olympeion at Athens.

Note 2. See the Parthenon, Temple of Zeus at Olympia, Theseion, Temples of Concord at Agregente, Poseidon at Paestum, and Temple of Segeste.

Note 3. Such as the Asklepion of Epidauros and the Metroon at Olympia.

Note 4. Olympeion of Agrigente, Temple of Apollo (G.T) of Selinonte.

Note 5. See the Heraion of Samos, Artemesion of Ephesus, Didymeion, and Aphrodision at Aphrodisias.

Note 6. Such as the Temple of Zeus at Labranda, that of A Athene Polias at Priene (1 9\10); those of Aizani, Magnesia on Meander (1 3\4); the Sanctuary of Athena Nike and the "Monument of the Nereids"(1 1\2).

If in case of a plan comprising a peristyle, for the point of view of the dimensions there be substituted that of the n number of isolated supports, the following ratios are obtained, whose correspondance with those of the measures cannot be absolute, since the intercolumniations are not equal. -- Note that the angle columns are counted twice.

Temple of Artemis at Syracuse	6 × 17 cols.
Temple C at Selinonte	6 × 17
Heraon at Olympia	6 × 16
Temple of Corinth	6 × 15
Temple of Phigaleia	6 × 15
Temple of Poseidon at Paestum	6 × 14
Temple S at Selinonte	6 × 14
Temple D at Selinonte	6 × 13
Temple of Zeus at Olympia	6 × 13
Temple of Concord at Agregente	6 × 13
Theseion at Athens	6 × 13
Temple of Athena on Acropolis	6 × 12
Temple of Aphaia at Egina	6 × 12
Metroon at Olympia	6 × 11
Asklepion at Epidauros	6 × 11
Temple of Labranda	6 × 11

Temple of Athena at Priene	6 × 11
Olympeion at Agrigente	7 × 14
Olympeion at Athens	8 × 20
Artemeseion at Ephesus	8 × 20
Temple of Apollo at Selinonte	8 × 17
Parthenon at Athens	8 × 17
Aphrodision at Aphrodisias	8 × 15
Artemesion at Magnesia	8 × 15
Temple of Aizani	8 × 15
Basilica at Paestum	9 × 18
Didymeion	10 × 21

The accepted form of the Grecian temple results from the superposition on a truncated pyramid with steps -- the stylobate, an oblong rectangle -- of the body of the deifice, with finally a triangular prisg resting on its facades -- the roof.

The facade had as a primary characteristic its moderate development in the vertical direction.(202). The greatest slenderness -- for example such as that of the Temple of Athena Nike at Athens -- scarcely extends to an excess of the width by the elevation.(212,E; 164). At the Parthenon the height of the elevation, measured from the platform to the apex of the pediment, is little more than 5/9 of the length of the colonnade. This peculiarity of height is so much more accented, since the top of the edifice is pointed in but a slight degree, for the rise of the pediment is never more than 1/7 its base, and it is sometimes diminished to even 1/10. [1]

Note 1. Nothing better expresses the Grecian conception of the proportions of an elevation, than the graphical comparison of two facades of very nearly equal widths, as that of the Temple of Apollo at Selinonte of 160.3 ft., and that of the Cathedral of Chartres of 156.2 ft.; while the former terminates at about 98.4 ft. with a very obtuse angle, the latter e elevates the apex of an acute gable to 180 ft. above the ground, the points of its spires being at 350.0 and 383.0 ft. ! (211,C).

321 A second trait in the form of the Grecian edifice is, that it is relatively lower as it is wider. [1] The unequal development of the two dimensions is explained by the necessity of protecting the appearance of the portico portion, to which

Grecian esthetics firmly adhered; since its height could not be increased beyond an altitude already quickly reached without increasing the diameters of the isolated supports, and b because the distances between these was narrowly limited by the small span of a stone architrave, the intercolumniations would have taken the appearance of actually narrow openings. It is no less true, that the ratio of the height of the facade
323 of the Parthenon is at the extreme limit accepted by the eye, and that from this point of view long Grecian facades, for e-example that of the Telesterion of Eleusis, were subject to criticism.

Note 1. In that respect, nothing is more edifying than a comparison of the facades of the Temple of Phigaleia and of the Parthenon, works of the same style and designed by the s same architect; the second was 2 1\6 times wider than the first, but was only 1 2\3 times higher.

Yet from statistics of the numerical relations observed between the elements of monumental Grecian elevations it results, that without comprising great differences, they were anything but fixed, and that their variations depend in a certain measure upon the relative diversity of Hellenic esthetics according to the place and the time.

Thus compared with the entirety of their contemporaries of Greece proper, the Doric edifices of the Hellas of Italy, and particularly those of Sicily, exhibit a tendency to develop vertical dimensions; this equally distinguishes in Greece the temples of the 4 th and 5 th centuries; but it is especially the productions of Ionicism -- those of Asia Minor more than those of Europe, however -- which it contrasts with those of Doricism. [1] It is marked by an actual increase in height of the platform, that sometimes accents the artifice of a shape adapted to facilitate the raising of the eye; sometimes it is a multiplication of the steps, which instead of the normal n number of three, has seven as at the Didymeion and at the Temple of Teos, ten as at the Artemesion of Ephesus, or even eleven as at the Temple of Apollo Smintheus in the Troad; sometimes it is a mode of superposing on the ordinary stepped substructure a plinth with sometimes very high edges, [2] (215,1), or of complicating the front steps by two projections cut off

at the level of the stylobate.[2] (215, 2).

Note 1. The ratio of the height of the facade (not including the pediment) to the width for the following temples is that of:--

Italy and Sicily.	
Paestum, Temple of Demeter	1 to 1.69
Agrigente, Temple of Concord	1 to 1.75
Segeste, Temple at	1 to 1.77
Selinonte, Temple C.	1 to 1.85
Agrigente, Olympeion	1 to 1.88
Paestum, Temple of Poseidon	1 to 1.90
Selinonte, Temple of Apollo	1 to 2.11
Greece proper.	
Cape Sunion, Temple at	1 to 1.61
Olympia, Metroon	1 to 1.73
Athens, Theseion	1 to 1.77
Epidauros, Tholos	1 to 1.77
Rhamnus, Temple of Nemesis	1 to 1.82
Egina, Temple of Aphaia	1 to 1.85
Phigalia, Temple of Apollo	1 to 1.86
Corinth, Temple of Apollo	1 to 1.89
Olympia, Temple of Zeus	1 to 1.93
Athens, Parthenon	1 to 2.25
Eleusis, Telesterion	1 to 3.45
Ionicism.	
Athens, Erechtheion (N. portico)	1 to 1.11
Athens, Temple of Athena Nike	1 to 1.34
Athens, Erechtheion (Caryatid portico)	1 to 1.70
Aizani, Temple at	1 to 1.80
Aphrodisias, Aphrodision	1 to 1.83
Didymeion	1 to 2.17

Note 2. See the Caryatid portico of the Erectheion, "Monument of Nereids" at Xanthos, Mausoleum of Halicarnassos, the second Artemesioon of Ephesus, Monument of Lysicrates at Athens, and the Great Altar of Pergamus.

Note 3. See the Didymeion.

324 Of effects capable of impressing a moral, we only see for noting those of majesty and intended domination, the former by the composition of monumental entrances; the second by the

arrangement of projections retarding admission, which constitute the elevation of the platform of the temple with regard to the ground, of the pronaos with reference to that of the peristyle, and of the pavement of the cell with regard to that of the vestibule.

Yet Hellenic architecture inclined to, and expert in charming the eyes by the picturesque appearance resulting from a
325 designed presentation of the edifice in accord with the point of view and with the natural monumental enclosure, and yet m more in satisfying the mind by the harmonious rythm of a balance of motives, such as were ordained by the designs of Halicarnassos, of the Altar of Pergamus, of Antioch etc.

III. Effects of Harmonic Order.

Nothing is more characteristic of Grecian architecture come to maturity, and which does it more honor, than its passion for effects of harmonic order, that produce the beauty of its lines, the correctness of its proportions, and the cadence of a rythm of relations.

Perfection of Form.

Perfection in execution, which is the necessary condition of all refinement in the matter of monumental relief, was never carried farther, than by the Greeks. In that respect, t their careful monuments of the best period are models of accuracy and of delicacy; the purity of the outlines, the freedom of the angles, the neatness of the surfaces and the accuracy of the jointing, afford to the eye and the mind satisfactions analagous to those produced in the musical order by the correctness of the sounds. We have stated (pages 289-291) w what minute precautions were taken, both to preserve from shock the delicate portions of blocks cut before setting, and to ensure a safe and correct placing of the materials. Let us add that the surfacing was delayed until after the entire completion of the construction, and was conscientiously executed by commencing at the top of the monument.[2]

Note 2. This does not mean that Grecian architects were s scrupulous in measuring. It was essential for the setting o out of their edifices to be perfect always; at Temple C of S Selinonte are measured differences of 7.9 ins. between two c consecutive intercolumniations, of 5.5 ins. between two adja-

adjacent triglyphs and metopes; the longer southern side of the Great Altar of Syracuse is 2.62 ft. longer than the Northern; the diameters of the columns of the Temple of Zeus at Olympia vary between 7.2 and 8.0 ft.; in an edifice as carefully exectted as the Parthenon, the apex of the pediment does not correspond to the middle of the central intercolumniation, and there is neither equality in widths of metopes and of triglyphs, nor an exact correspondence of the triglyphs with the axes of the columns. The truth is that the Greekr were properly contented with the appearance of regularity.

Care for the purity of line is emphasized in edifices executed with particular care by artifices entirely significant, with a view of correcting the disturbing effects of certain
326 optical illusions. Thus for the appearance of deflection presented by every horizontal line of considerable length, and which must affect the edge of the platform as well as that of the entablature; the architects of the Temple of Apollo at C Corinth, of Poseidon at Paestum, of the Parthenon, of the Propyleion and of the Theseion, counteracted this by imparting to the lines mentioned a vertical curvature upward. [1] Thus again for the illusion of a reduction at mid-height, which a affects the view of a prism or a cylinder; this was remedied by a curvature of the antes and columns, i.e., by giving them a slight curve, according to a hyperbolic or parabolic profi-
327 le, that was at first quite marked and then scarcely perceptible. [2] (217). They took care to counteract by a slight increase in diameter the apparent reduction of the angle columns. by the effect of light, which at a certain position of the observer "washes and consumes" them, -- these are the words of Vitruvius. Another precaution was to slightly incline forward the face of the Ionic entablature, which was lower than t the Doric (page 303), and that risked the appearance of slanting backward, [3] as Vitruvius again says. (201, 1).

Note 1. At the Parthenon the convexity forms an elliptical curve, pronounced at its ends, whose rise at one end measures 2 9\16 ins. for a length of 98.5 ft., and at a sode is 4 7\8 ins. for 209.0 ft.

At the Temple of Paestum, the rise at the facade is 13\16 in. for a distance of 78.7 ft., and 1 9\16 ins. for 97.0 ft.

at the side; at the Propyleion it is 1 9\16 ins. for a base of 78.7 ft.

Note 2. The proportion of this curvature, termed entasis by the Greeks, was variable. For some Athenian buildings are given its ratio to the height of the shaft.

Olympeion, 1 to 382. -- Parthenon, 1 to 552. -- Erechtheion, 1 to 1080. -- Propyleion, 1 to 400. -- Theseion, 1 to 708.

The shafts of the columns of the Didymeion are cylindrical for the lower third of their height; the seventh drum is a t truncated cone, and the eleven others are also truncated conically, but in a lesser proportion. (217, 3).

Note 3. Indeed an inscription engraved on the ante of the Temple of Priene attests, that the Greeks knew how to calculate the increase of height necessary, so that the apparent r reduction of dimensions in proportion to its height from the ground should be compensated.

The Logic of the Forms.

All the elements of a Grecian mounmental arrangement conspired in the production of a powerful effect of harmony; for on the one hand, the forms of the members were rigorously determined by the general structure of the edifice and by the proper function of each one; on the other, a strict discipline ensured their reciprocal dependence and the subordination of the detail to the whole.

The secondary relief of the Grecian edifice had as its dominating character, that of being profoundly rational, like a
all other elements of Hellenic architecture; on such grounds,
that it is possible to take account of its various diversiti-
328 es, that are regarded as functions of stone construction, or
that are regarded as proposed, to an original arrangement of
carpentry, translated into stone. (Page 314).

Not that it was structural. It -- which is observed only in the classical epoch and on the most carefully executed buildings -- there is an accord of the masonry and of the form, the latter has demanded this; there is no better evidence of this than the structure of the Doric frieze; (page 305; 203,2) the metopes there being only independent of the triglyphs, w when they comprise a sculptured decoration, which it is best to execute before setting; indeed when the material was not

marble, the masonry was masked by a coating. What we have j
just said in regard to the relief of stone is equally true f
for that of wood; for carpenters and joiners demand the effe-
ct of relief, not carved out of the mass, but by overlays of
boards, bandss,and mouldings.

In other qualities resides the logic of forms, that the Gr-
eeks imposed on an architectural member; in their adaptation
to its organic function, in their accommodation to its relat-
329 ive situation on the elevation, and to the degree of its ligh-
ting; also in a wise application of the principle of least e
effort, i.e., in the choice of profiles, whose agreement with
those easily realized by the work of the quarrymen and of the
stonecutters reduces to the minimum the operations of cutting
and setting.

Relations and Proportions.

It is on reason as much as on sentiment, and even in a very
large measure on the use of systems, and up to a certain poi-
nt -- at least to the decline of Hellenic art -- on the appli-
cation of formulas, that depends the proportioning of the di-
mensions of an architectural member, and of the different pa-
rts of a whole.

And at first -- at least concerning the temples -- the rhy-
thm was abstract, for it was not the stature of man that gave
the key; the steps of the substructure did not have their he-
ights fixed by the normal magnitude of the elevating movement
of the foot, no more than the height of a doorway was in rel-
ation to the human height. A monumental Grecian arrangement
was not on the scale of any reality outside itself; it consis-
ted in a sort of mathematical scale, whose initial note was
chosen by the architect.

It was frequently regulated by a harmonic system, relating
each dimension of a monument to the same measure, which made
of it a multiple or exact submultiple of that standard, so t
that all the elements, heights, widths, solids, voids, projec-
tions and recessions -- were "symmetrical", to speak as the
Greeks, and commensurable, to employ our vocabulary. The me-
asure termed "module"was sometimes a principal dimension --
the length of a facade, sometimes a secondary one -- the hei-
ght of an isolated support, sometimes one of a detail -- the

diameter of a column or the width of a triglyph. Thus the f facade of the Arsenal of the Piraeus was proportioned with r respect to its width; its height to the apex of its cornice was the half of that dimension; that of the lintel of the doorway equaled two thirds of the half of the basal dimension, while its length was precisely equal to that half, etc.

Practically, that harmonic scale is confounded with a scale of measures, [1] by reason of the precaution taken by the Gree-
330 ks to figure all dimensions, particularly the initial ones, in an entire number of feet, of inches, of palms or of fingers, [2] free to change fractions into round numbers. [3].

Note 1. The facade of the Temple of Poseidon at Paestum o offers a typical example of the combination of the two systems. (219,1). On the one hand, if the width of the platform be divided into 12 equal parts, it is found that the first a and last determine the position of the axes of the entrance columns, and the others, when grouped in pairs, the axes of the other columns, their height etc. The width between the axes of the extreme columns being taken as an initial measure, there is obtained with 1\5 its measure the average intercolumniation and the entablature, including the gutter; with 2\5 of it, the height of the columns, and with 3\20, the rise of the pediment; with 1\25, the average half diameter and the h height of the capital; with 3\25, the length of its abacus; with 1\15, the depth of the architrave, of the frieze and of the cornice. On the other hand, all the large figures are w whole numbers of Italian feet equal to a standard dimension; the intercolumniation, mean half diameter of the column, or to its exact multiples.

Note 2. The value of the foot, divided into inches and palms, varied according to the place and the time. The Olympian foot was 1.051 ft.; the primitive foot of Athens was 1.079 ft.; that of Magno Grecia was 0.97 ft, and that of Miletus a and of Priene was 0.97 ft.

Note 3. The Greeks sought for square numbers, the "powers". Thus the sums of the feet expressing the height of the facade of the Arsenal of Piraeus, that of its side facades and the width of the doorway, repeatedly express the square of 6, the cube and square of 3.

The arithmetical modulary system of putting into proportion was in competition, and sometimes in the same arrangement with the graphical method of a geometrical construction, for w which served as basis an initial line of the drawing. Sometimes the figure was a triangle, either equilateral, or right=angled of the egyptian type with sides in proportion to the numbers 3, 4 and 5; or isosceles, with height to base as 2 1/2 to 4; sometimes the figure was a square or a rectangle. The sketches in Fig. 219 indicate the method and utility of the operations.

This research for monumental harmony by rational ways and by scientific methods closely connected the esthetics of the architecture of the Greeks to that of their statuary, which made the beauty of a statue depend upon the "harmony of the members"and on the "accord of most of the numbers"; in a more general way, it perfectly accorded with the logical turn of Hellenic genius, and with the taste of the Greeks for mathematical speculations.

331 That led directly to the formula, to the canon as the Greeks said. Indeed, there were architectural canons, as there were those for statuary, and from the beginning of the 4 th century, the masters of the art of building were pleased to state in treatises on the theoretical systems of proportions.

332 The passage from the formula to the recipe was fatal; it w was accomplished by the Hellenistic art at the decline of the Pagan epoch, and Vitruvius gives us an idea of its results. [1] But it was necessary at even that epoch for the Grecian architect to proceed as an engineer. From the canon he demanded only a general lay-out, and it was only by approximation, that he determined the definitive outlines, in taking into account particular requirements and especially the demands of t the eye. [2] For these amendments the Hellenistic epoch aided itself by formulas. Thus to determine the height of the columns, that necessarily should be proportioned to their spacing, it did not employ the general canon, that fixed the desired magnitude at the value of 10 modules, of 9 1/2, 9, 8 1/2 or 8, according to whether the intercolumniation was "minimum", "narrow","proper", "wide" or "extreme".

Note 1. For example, here is a practical method for arran-

arranging the facade of a Doric temple with six columns; divide the width into 42 parts, one of which will serve for the module, taken once, this gives the half diameter of the column; its height is 14 times; if the programme comprises but 4 columns, take for the module 1\27 of the width etc.

Note 2. Thus, resuming the previously utilized facade of the Temple of Poseidon at Paestum, it is evident that the actual distances between axes of the columns do not accord strictly with the theoretical, which equals 15 ft; the two extreme intercolumniations measure 15 ft. less 3 ins., and the o others are 15 ft. plus 2 ins. Being forced by reasons of appearance, which we shall explain later (page 344), to reduce the last intercolumniations, the architect did not fail to m make flexible the theoretical rigidity of the modulary system.

In truth, so that it was harmonious by measure or canon, t the putting into systematic proportion was never, in the eyes of the Greeks, an absolute method susceptible of mechanical application, but rather a practical means for reducing attempts by reference to a pattern, whose method of establishment guaranteed an average accuracy; on the whole it favored the research for harmony, in the same fashion that the ruling of squared paper ficilitates the outlining of a plan. That is so true, that even a poor formulist like Vitruvius does not fail to specify, that "the symmetries being well established and the measures accorately taken, this will make proof of t talent as well as to know, according to the nature of the location, what custom and beauty demand, to omit or to add --- to introduce all necessary modifications".[4]

Note 3. The technical nomenclature was:-- Pycnostyle, intercolumniation equal to 1 1\2 modules; systyle, interculumniation 2 modules; eustyle, 2 1\4 modules; diastyle, 3 modules; aerostyle, 4 modules.

Note 4. De Architectura. VI. II, I.

338 Chapter 6. The Effect.

II. Effects of Secondary Relief. The Orders.

The secondary relief of a Grecian edifice, as we have already noted, found itself strictly determined by the choice, t that the architect made of one of the usual formulas for the elevation; for each was indeed equally calculated the number of elements, their general forms and their respective places, hence their name of "Orders".

They were two, the Doric and the Ionic. The adoption of t
339 the former was subject to a rigorous discipline; the application of the second comprised some liberties for the details.

Besides these general modes of arrangement existed some particular types of elements, of which the principal was the Corinthian, Particularly to construct the interiors of temples with several aisles and porticos in two stories, the Greeks readily superposed two tiers of isolated supports separated by an entablature.(167; 181; 200). Most frequently the two tiers were designed in the same mode. When this was the Doric, the upper columns were so shaped that their outlines prolonged those of the lower tier.

Yet Hellenic architecture did not object to associate in t the same monument, even to group in a series supports of different orders. Thus for example, in edifices of the Doric s style like the Parthenon and the Propyleion, Ionic columns s supported there the ceiling of the hall of the maiden goddess, here that of the aisle in the rear of the front portico; in the interior of the Temple of Phigalia, a Corinthian column was near the Ionic, while the Doric extended on the portico; at the porticos enclosing the Temple of Athena at Pergamus, the upper gallery was Ionic and that of the ground story was Doric.

I. The Doric Style.

In the judgement of the artist like the historian, the composition of the Doric style was the most remarkable work of Grecian architecture; more original than its rival Ionic, more expressive than that of the Hellenic temperament, it is a also more thoroughly architectural. Deriving its entire effects from a frank manifestation of the functions, with a rational and harmonious composition of the parts and a refined

formation of the elements, it satisfied the eyes and delighted the mind. Considered in the average of its applications, it responds to an ideal of force and of dignity, which at least until the end of the classical epoch, comprised the risks of heaviness and coldness; a chronological classification of its works reveals besides a remarkable permanence of its essential traits, a succession of variations, which attest an incessant effort toward the better, a regular advance and a marked evolution in the sense of elegance.

335 The Substructure.

The part given to the stylobate in the greatest number of the superior edifices of the style in the classical period -- we will name the Temple of Poseidon at Paestum, the Temple of Zeus at Olympia, the Parthenon and the Temple of Phigalia -- vary between the ninth and the eleventh of the total height exclusive of the pediment, the general subdivision being into three steps. A considerably greater height characterizes, on the one hand, several temples in Sicily, notably those of Selinonte designated by the letters C, D and R, and on the other, some edifices of the 4 th century -- such as the Asclepion of Epidauros.

As for the forms of the steps, this comprises many variants. Sometimes, as at Nemea, they were all of the same height; more frequently they were unequal, the upper ones being highest. Sometimes, as at the Parthenon, their width was a minimum; s sometimes, as at the Temple of Poseidon at Paestum, it approached the vertical dimension, but rarely exceeded it. Finally the riser was sometimes plane, sometimes recessed more or less at the bottom, with a simple or compound moulding at the recess.

The Wall.

The normal relief of a Doric wall was reduced to a small n number of movements, very little accented and of the simplest profile, confined to the base and top of the elevation. On the one hand -- thus at the Parthenon -- were the very slight offsets of the courses of the plinth and of the orthostate, (221,4; 195,7), and on the other -- for example the Temple of Zeus at Olympia -- the small projection of a simple moulding, profiled it is true, as a bird's beak in a manner to properly

separate the upper border from the wall by a strip of shadow. (222,1). The Doric style always admitted some complications and a little variation, notably at Athens, where it was influenced by its rival; such as the arrangement of a rudimentary cornice by the placing of a very slightly projecting band beneath the terminal moulding -- this solution may be observed at Egina (222,2) -- or a band supported by a moulding in the manner of that shown by the Parthenon (221,3); such again was an ogee in the profile of the plinth, an example of which is offered by the Theseion (221,5). It might occur, as proved by the Treasury of Sicyon at Olympia, that the wall was orna-
336 mented over its upper part by a frieze of triglyphs and metopes, or as at the Parthenon by a sculptured band (221,6), or that its surface was broken by a series of engaged columns, as the case at the Olympeion of Agrigente.

The Doric solutions of the problem of the formation of the top of the wall manifest an evolution in taste. At first was an inclination to relate the appearance of the antes to that of the columns adjoining them; indeed the Temple D of Selinonte, the Temple of Apollo (G.T.) in the same city and the "Basilica"of Paestum exhibit the application of a system of termination by the penetration of the wall into a member in the form of an isolated support, a column in the first case, and in the two others a square pier crowned by a capital, more or less developed.(222,2,3). The epoch of attempts closed, the modeling of the antes was strictly allied to that of the wall; scarcely did this project beyond its face and not always on its two surfaces; its corners corresponded to those of the wall, and it was inclined like that; it even had the same base and cap, excepting that the latter was frequently a little more accented and labored.(222).

337 As for the doorways, the simplicity of their enclosure was scarcely relieved by a modest moulding recessed in bands.

The Facade with Portico.

The proportioning of the different magnitudes combined in the arrangement of a facade with portico -- respective heights of the colonnade and of the entablature, the solids of the supports and the voids of the intervals, the vertical and horizontal dimensions of the shafts -- is conditioned by a lim-

limitation and by a liberty; limitation by the impossibility of exaggerating the span of a stone beam; the power for the same entire elevation, of increasing or reducing the part of the colonnade, and by reason of the excellence of the construction, of largely reducing the isolated support. It was again influenced by the progress of the taste for slenderness, manifested by all the schools of architecture.

The Colonnade. -- Compared woth regard to stature, the existing Doric columns are classed in three categories:-- the stumpy, whose height measures less than five times their diameter at the base, and of which no specimens exist later than the middle of the 5 th century. [1] (223,S,C); the medium, into the height of which the diameter at the base goes between 5 1/3 and 6 times, [2] and which are generally contemporaneous w with the second half of the 5 th century (223,P); finally, t the slender, whose altitude is equivalent to at least 6 to 7 diameters, the fashion of which was commenced by the 4 th century. [3] (223,N).

Note 1. Artemesion of Syracuse; Temple of Corinth; Temples of Poseidon and of Demeter at Paestum; Basilica at Paestum; Temples C, D and of Apollo at Selinonte; Temple of Zeus at O Olympia.

Note 2. Temple of Apollo at Phigalia; Parthenon, Theseion and Propyleion at Athens; Temples of Aphaia at Egina, of Athena at Tegea, and of Poseidon at Sunion.

Note 3. Temples of Nemea, of Athena Polias and of Dionysos at Pergamos.

An advance with the same tendency and nearly contemporary developed the colonnade at the expense of the entablature to the point at which for the total height, the latter received from the architecture of the 4 th century only 5/12 of the p part assigned to it by that of the 6 th. [4] (223).

Note 4. When at the Temple of Corinth (6 th century), the percentage of the colonnade is 63, it increases a little later to a little more than 66 at the Temple of Poseidon at Paestum, to 73 at the Temple of Olympia, to nearly 77 at the Parthenon, to 78 at the Metroon of Olympia, and to nearly 80 at the Temple of Nemea.

On the contrary, omitting some archaic edifices -- such as

338 the Heraon of Olympia -- where the use of wooden architraves permitted wider spacing of the supports -- and others -- such as the so-called Temple of Artemis at Syracuse (223,() -- where the timidity of a stone construction at its beginning exaggerated their proximity, the ratio of the voids to the solids of the colonnade was entirely stable, -- the Greeks having reduced the intervals as they diminished the diameters. [1]

Note 1. The most frequent ratios between the measures of the diameters and of the intervals are these:-- 1 to 1 1\7, (Temples of Corinth and of Poseidon at Paestum); 1 to 1 1\4, (Temples of Segeste, of Concord at Agrigente and the Parthenon); 1 to 1 1\2, (Temple of Apollo at Selinonte, the later p-port; Temple of phigalia and Asklepion of Epidauros); 1 to 1 2\3, (Theseion, Temple of Egina, Temple D of Selinonte); 1 to 1 3\4, adopted for the Temple of Zeus at Olympia, is exceptional; the same for 1 to 2 1\3, chosen for the central passage of the propyleion of Athens. (224).

For a diameter of 100, the voids are :--

70, Temple of Artemis at Syracuse.
115, Temples of Corinth, of poseidon at Paestum.
124, Propyleion of Athens, average intervals.
127, Parthenon, Temple of Nemea.
150, Temple G at Selinonte, later portion.
161, Theseion at Athens.
175, Temple of Zeus, Olympia.
185, Heraion, Olympia.
239, Propyleion of Athens, middle interval.

339 A comparison of the intercolumniations of the same portico reveals inequalities already mentioned (page 325, note 2); w without speaking of those that may be imputed to eerors of l location, or to the desire of dinoting by a greater width of passage corresponding to the entrance to the edifice, as premeditated, and for which we shall give a reason a little later. [2] (Page 344).

Note 2. Here are some examples of facades (the measures b being taken between the axes of the columns. (Metres ?).

Temple C at Selinonte, 4.25-4.46-4.54-4.46-4.25.

Parthenon, 3.71-4.26-4.32-4.32-4.32-4.26-3.71.

The Column. -- With very rare exceptions, almost all contem-

contemporary with the Hellenistic epoch and imputable to artists, who were accustomed to the appearance of the Ionic order and had no longer any sentiment for the construction of i its rival, the Doric column never comprises a base.[3]

Note 3. The arrangement, otherwise exceptional in all respects, of the Olympeion of Agrigente, comprised the continuation on the shafts of engaged columns, of the moulding extending on the wall. As an example of the Hellenistic epoch may be cited the columns of the Temple of Dionysos at Pergamus.

The ratio of the height of the capital to that of the shaft suffers variations concomitant to those already noted with regard to the ratio of the colonnade to the entablature, and l
340 like that, determined by a tendency to reduce more and more the role of the upper parts; when the 6 th century assigned to the capital at least 1/8 of the total altitude of the support, the 5 th gave it only 1/12, and the 4 th accorded to it no more than 1/27.[1] (224).

Note 1. Here are some ratios of the height of the capital to that of the column.

Corinth	1 to 7.80
Selinonte, C	1 to 8.20
Segeste	1 to 9.49
Theseion	1 to 11.25
Parthenon	1 to 12.12
Nemea	1 to 27.38
Pergamus, Temple of Dionysos	1 to 30.00

By so doing, architecture yielded to a general movement, w which led contemporaneous sculpture to diminish the part of the head in the representation of a man.

It is the same for the diminution of the shaft; the inclination of the outline from the vertical varies per ft. in hei-
341 ght from 0.55 to 0.24 inch, according to whether the example precedes the 5 th century or not.

The shaft was channeled by flutes, whose number was usually 20; sometimes and especially in the primitive epoch, 16; rarely 12, 18, 24 or 28. The profile of their section was calculated to accent the contrast of the lights and shades, opposing to the sharp edges ellepitcal curves, relatively deep and sometimes rounded at their ends.(226,3). The refinement in

relief forming the flutes tended to two ends; at the same time that it gave body to the column, which if plain would have lacked the brilliant lighting, it energetically emphasized its function as support by multiplying the indications of verticality. Eager for novelty, the Hellenistic epoch sometimes imagined the replacing of the flutes by flat sides -- the square portico and the houses of Delos present examples contemporaneous with the 2 nd century, either as at delos or at the Temple of Athena Polias at Pergamus, confining these to the two ends of the shaft, an appearance which would have caused in the Greeks of the 6 th and 5 th centuries the idea of an unfinished facing, and that gives to us that of a normal support, partly masked by a case.

The capital was well shaped in view of the manifestation of its twofold role of a structural intermediate concentrating t the load of the architrave on the head of the shaft, and of an intermediate sculpture forming the transition from the plane and angular appearance of the former of these members to the roundness of the latter. Indeed it was composed of an upper element, a square slab termed an abacus, and a lower part named the echinus, primitively fashioned with a curved edge, as may be seen figured on painted vases, later as a truncated conical cushion, more or less expanded. Moved by the desire, t
342 that we shall certainly observe in this portion of our study, to make evident the function of an organ, the Greeks endeavored to free the profile of the capital from the confusion in appearance, threatened by its position in a shadow. Resuming the principle first applied in the flutes, they thought to distinguish the echinus from the shaft by masking the end of the former and the beginning of the latter by means of a collar of horizontal grooves termed annulets (226;2,4-6; 225; 227); besides that the primitive school, particularly in Italy and Sicily, voluntarily had recourse to a reduction at the top of the trunk, known under the name of gorge, and that the classical epoch rejected.(226,1; 227,1,2).

The profile of the Doric capital varies according to the epochs, affected by an evolution parallel to that noted in rega-
343 rd to the entire column, and in the same direction. Under its primitive form, it projected excessively beyond the shaft as

well as the architrave, the slope of the echinus with reference to the plane of the top of the trunk never exceeding 30°; from the beginning of the 6 th century, its projection was sensibly reduced; in the first half of the 5 th century -- as proved by the order of the Temple of Poseidon at Paestum or that of the Temple of Zeus at Olympia -- the inclination of the echinus already increased to 40°; the Attic school of the great epoch opened the angle to about 45°, and the Hellenistic epoch carried it to 50° or 55°. The horizontal dimensions of the abacus having always been controlled by those of the echinus, w which it scarcely exceeded, the innovations just described progressively reduced -- to the great benefit of the effect -- t the projection of the slab before the architrave. The change must become more apparent, since the face of the entablature, at first vertically over the top of the trunk, was set forward of it from the beginning of the 5 th century. (227, A-D). Modified at the same time and influenced by the same movement were the curve of the echinus and the thickness of the abacus; the former being at first a little loose and even ineffective, became more prominent, while the second, after having been a little higher than the cushion, from the 5 th century no longer equalled more than 5/6 or even 5/7 of its height. (227,1-6).

The Entablature. -- The arrangement of the Doric entablature was nothing more than a smaller repetition of the general theme of the order, with some variations; to the three parts of the latter corresponded the three zones that it superposed; t the architrave to the stylobate, the frieze to the colonnade, and the cornice to the entablature. (222).

The slight projection of a narrow band, doubled vertically beneath each triglyph, distinguished the individuality of the architrave in the entirety of the entablature.

By the simplicity and the freedom of its prismatic form with plane faces and straight edges, this member was endowed with a character of robustness and severity, appropriate to the nature and function of its work. At first equal to the frieze, at its expense was accomplished after the 5 th century the diminution of the height of the entablature, that we have already mentioned. That resulted in an excess, which reduced the appearance of stability implied by the capital importance of this

beam, and constituted an infraction of the law of harmony regulating Hellenic architecture.

Real or imitative, as its function was or was not structural,[1] the frieze developed a facade of a blind portico, by the alternation of piers -- of triglyphs and niches -- the metopes. I Indeed the relief of the former aroused the idea of isolated supports; their faces were grooved by vertical "channels", the exact equivalents of the flutes of columns, and their tops presented a projecting band, that recalled so much the more the abacus of the capital, because by a partial chamfering of the angles of the block, its upper corners overhang.(203,2; 225; 258). Like all the elements of the Doric order, the triglyphs gained in slenderness in the measure, that Grecian architecture advanced from its beginnings; at first being nearly cubical, they were twice as high as wide in the classical epoch.

Note 1. See below; Chapter 4, pages 328, 305; Fig. 203,2.

The arrangement of the frieze presented a difficult problem. By reason of their appearance as isolated supports, the triglyphs had their places indicated; at first vertically over each column and at the end of each facade, to represent the support of the angle of the cornice, and then in the middle of the length of the architraves. Now the angle triglyph being necessarily outside the axis of the last column, the last metope must be wider than the others (228,A,B). Ungraceful in itself, this elongation would have introduced a shocking discord into t the harmony of the frieze.

The Greeks got out of the affair by the artifice of a contraction of the last intercolumniation, even as observed on the Temple of Poseidon at Paestum, by the reduction of the two last, which better accommodated passage. For a long time was a harmonizing of the opposed requirements of the colonnade and of the frieze; sometimes the reduction of the two last intercolumniations was not what it should have been -- thus at the Temple mentioned at Paestum, the contraction was not one half that required by the theory (0.59 instead of 1.28 ft.); sometimes as at the Temple of Segeste, they cheated in the relation of the triglyphs to the columns.(228,C). More strict, the classical school reduced the last intercolumniation as much as
345 necessary to ensure both equality of metopes and correspondence

of the axes.(228,D).

If it concerns a frieze under a portico, the difficulty is complicated by the fact, that the architect could not effect at the same time the concord of the triglyphs with the columns and that of the ceiling beams with the triglyphs. The archaic epoch sacrificed the first to the second (228,A); the 5 th ce-ntury proceeded inversely (228,B). There was only one means of avoiding the appearance of discord, disagreeable to the eye and painful to the mind, assumed by the triglyphs or beams, a-according to the case; this was to suppress the former. It w was employed at the Parthenon with a certain reserve, that ma-rks the illogical retaining below the frieze of the regula and drops placed under the triglyph (228, II,C); on the contrary, the application of the remedy was radical at the Theseion. (228,II,D).

346 These difficulties repulsed the architects of the Hellenistic epoch, who diverted elsewhere from the Doric order their t taste for a graceful and picturesque effects. They proscribed it on the pretext, that its proportions were "false and untruthful".[1]

Note 1. Mendosa et disconvenientes. Vitruvius. IV,III,1.

The cornice reveals the same phenomenon of progressive diminution in the course of centuries manifested by all the upper parts of the Doric order; in the 6 th century, its height equaled 2/3 that of the frieze; in the 5 th, it scarcely equaled 2/5 of it, and in the 4 th, it practically attained just 1/3. Altogether its relief was structural, conformed to the necessity of carrying rain water away from the facades.(199; 201; 225).

The care for effect always introduced some complications; t
thus to detach on the sky the outline of the edifice, they em-
ployed on the upper zone or cyma a wavy profile, very well su-
ited to impress the eye by the contrasts of light and shade p
produced by it, and to which the Greeks had applied the expre-
347 ssive name of a "little space"(cymation). Thus again, with t
the view of both diversifying the shaded vertical face of the
cornice,and of recalling the rhythm of alternating solids and
voids, which characterizes the colonnade and the frieze, they
carved on this "soffit" above each triglyph and the middle of
each metope, a tablet termed mutule, decorated by 18 cylindri-

cylindrical or conical projections called drops.

Faithful to the principle of propriety, the Greeks suppressed in the cornices beneath a portico all the useful forms, and replaced them by an arrangement of gorges and projections appropriate to the role of a cap.(221,1,2,3).

Such was the wise rhythm of solids and voids, of verticals and horizontals, of curves and straight lines, of planes and rounded surfaces, of lights and shadows, whose production doubtless forms the principal title to glory for Hellenic architecture.

III. The Ionic Style.

Compared to the Doric, the Ionic order manifests another esthetic ideal.

First it differs by a much more slender **stature**, with a tendency to thinness and even to dryness.(230). Further its forms are not modeled in the same taste, nor conceived in the same spirit; it was fond of curvatures, flexures and transitions; although it constituted an organic entirety, it aimed to charm the eye by the advantage of a picturesque relief or of a brilliant ornamentation, as much if not more, than to satisfy the mind by the exhibition of the construction, the expression of the function, or the harmony of the proportions. Finally, if for the general orientation and the chronology of the great s stages, its evolution is analagous to that of its rival, for energy and charm, it is clearly distinguished. Like the Doric, the Ionic regularly increased in slenderness, particularly from the 6 th century, until it attained an excessive garcefuln-
348 ess (233); like it, it had its epochs of infancy, of youth and of maturity, respectively contemporaneous with the 7 th century, the 6 th, and the second half of the 5 th. But besides t that its old age was singularly longer and more green, its development, considered in its entirety and in each of its periods, does not reveal to the same degree that unity, that certainty, nor that refinement in perfection, which recommends its rival; on the contrary it comprises a quite considerable portion of wanderings and of innovations.

The Wall.

In a general way, what we have said of the relief of the wall in the Doric style is true for the corresponding element of

an edifice of the Ionic or Corinthian style, with the reservation of the secondary differences, that from the 4 th century constitute a multiplication of movements and a variation of p profiles. The incidents of the modeling consist in hollows as well as projections. There were sunken drafts bordering the joints of the masonry, as on the Choragic Monument of Lysicrates (190); niches enclosed by cornices and columns, like those observed at the portico of Athene Polias at Pergamus and at t the peribolus of the Aphrodision of Aphrodisias; pilasters, examples of which are offered by the Bidymeion, and the propyleion of the Temple of Athena at Priene (232), and of engaged c columns, such as those presented by the Philippeion of Olympia or the Ghoragic Monument of Lysicrates.(190).

Richly defined by architraves with numerous reveals, surmounted by caps supported by consoles, doorways like that of the northern facade of the Erechtheion, almost suffice for the ornamentation of a great area of the wall.(262). Although more simple, the enclosure of the windows with its detailed mouldings and the ears making the ends of the lintel, also constitute a very appreciable enhancement.

349 The profile of the plinth had for its essential element the motive of the torus grooved by horizontal fluets (231,2); that of the cornice was a prolonged undulation interrupted by astragals.(231,1,3). The ante showed a tendency to make its appearance approximate that of the capital; that was accented in t the 4 th century by the projection -- observed on the Temple of Tegea and on the Didymeion -- of diminutives of volutes on the sides of the capital.(231,4; 232).

The Facade with Portico.

Statistics of the numbers that represent the ratio of the h height of the column to the lower diameter of the shaft, and that of the colonnade to the entablature, furnish both a proof of the essential character of the tendency of the Ionic order to become more slender, and an accurate measure of its progress in this sense in the course of its history.(233).

From the 6 th century -- witness the Heraon of Samos -- columns were erected, whose altitude amounted to 7 1/4 diameters; and from the second half of the following century, one of 9 to 10 diameters was the rule. [1]

Note 1.	Samos	7.26 diameters.
	Athena Nike	7.70
	Erechtheion, portico	9.06
	Erechtheion, N. portico	9.26
	Didymeion	9.80
	Aizani	9.89
	Propyleion	9.94
	Phigalia	9.94

It is proper to observe, that for the two last types, the d dangers to the isolated support were reduced by the location of the first beneath the portico, and by that of the second at the tops of the projections.

Likewise for the part of the colonnade in the entire elevat-
350 ion of a facade; within the limits of our information, we note that it varies from 75 to 84 per cent, the first of these being furnished by the Temple of Athena Nike at Athens, and the second by that of Apollo at Didyma.[1] (233).

Note 1. Athena Nike, 75 per cent; -- Erechtheion, north, 79 per cent; Aezani, 81 per cent, Didymeion, 84 per cent.

In the Ionic order as in the Doric, making the supports more slender introduced a proportional reduction of their intervals. On the contrary, their spacing was regular.

The Column. -- Because of the slenderness of its shaft and the smallness of its section, the Ionic column could not do without a base, which distributed the load transmitted by the support over a sufficient extent of the bearing area. This i inserted members, like its Assyrian and Hittite prototypes (pages 145, 157), and presents the appearance of a pile of disks, whose height varies in the specimens from 1/14 to 1/25 of the total height of the column.[2]

Note 2.	Athena Nike	1\14
	Aezani	1\15
	Heraon of Samos	1\17 to 1\18.
	Propyleion	1\23
	Erechtheion, east	1\24 to 1\25.

It invariably projected beyond the shaft; but in regard to the shape, it comprised four varieties; a first, whose known
351 examples belong to Asia Minor (Heraon of Samos, Temple of Ath-
352 ena at Priene and the Didymeion), more or less equivalent to

a cylinder (234,3-6; 238; 239); a second, whose formula was a
applied with moderation by the Attic school of the 5 th centu-
ry, and with a certain exaggeration by the architecture of the
4 th century, inscribed within a truncated cone more or less
hollowed (234,7-10; 229; 236; 248); a third, which obtained t
the favor of the Hellenistic epoch, accented the characterist-
ic of the type by interposing between the proper base and the
ground a slab termed plinth, generally square, sometimes poly-
gonal or circular as at the Didymeion.(233, 11-14; 235); fina-
353 lly a fourth, specimens of which are very rare -- we can cite
only those of the Temple of Naucratis and of the Artemeseion of
Ephesus -- superposed two bases, the lower being of the ordin-
354 ary type, the second in the form of a high drum, cylindrical
or truncated conical.(234,4,5). From the point of view of the
secondary relief of their mass may be distinguished three sor-
ts of bases: that whose profile only comprises a restricted n
number of movements, and whose dominant element is an ample c
curve, alternately convex (torus) and concave (cavetto) --- it
possessed the favor of Attica in the 5 th century (234,5-10);
that preferred by Ionia in the 4 th century as well as in the
6 th, and which multiplied the elements (234,3-6); that prefer-
red by Greece proper in the 4 th century, which reduces the p
part of the torus and comprises angular recesses and largely
open hollows.(234, 11-14).

Like the Doric, the Ionic shaft is diminished and with an e entasis, but is much smaller in proportions, [1] so much the less to the eye, since at the two ends it slightly expands in a curve termed apophyge, whose useful function is to enlarge the bearing area and the supported area of the trunk, with the esthetic role of arranging a transition to the base and the capital.

Note 1. Diminution of shafts:--

Samos	0.0128 inch per ft.
Athena Nike	0.0064
Didymeion	0.0064
Erechtheion	0.0052
Propyleion	0.0049
Aezani	0.0027

Primitively plain, as indicated by the fragment discovered

at Napea and the remains of the Heraon of Samos, the Ionic sh-
aft was early fluted like the Doric, but with differences exp-
plained by its more slender stature and its more graceful form;
more numerous flutes -- especially at the beginning [2]-- and t
therefore narrower; edges at first sharp but with fillets from
the 6 th century; section of the curved flute either semicirc-
ular or oval.(237).

Note 2. There are counted 40 at the Temple of Ephesus, 44
on the Column of Naxos at Delphi; 24 was the rule in the 5 th
century and 20 in the 4 th.

The form treatment of the Ionic capital was adapted to its
function, as it satisfied all requirements for effect; for at
the same time that the development of its mass is realized or
simulated -- according to whether it was loaded on its entire
surface (239,9,17), or whether the insertion of a central slab
relieved its ends (238) -- a useful relief for the architrave,
255 its model arranged a happy transition between the planes and
angles of the entablature on the one hand, and on the other t
the round form of the shaft. Indeed, its finished type assoc-
iated two parts of plane and angular appearance with two of c
curved appearance.

On an echinus of spheroidal form is placed a slab, whose pl-
an is rectangular and the long edges are cut vertically, but
each end of which is scrolled in a volute producing the appear-
ance of a cylinder or of a spiral, according to whether it is
viewed from the front or side; the whole is crowned by a rect-
angular abacus.(229; 236; 238; 244).

A chronological classification of the various forms, that h
have clothed the Ionic capital permits both to discern its or-
356 igins and to render account of its relief, whose classical fo-
rmula is a hybrid of two different orders.

Primitively, it only comprised the upper part, the slab and
the volutes. There further existed two variants, both origin-
ated in continental and insular Ionia.

A primary one, examples of which have been discovered at Ne-
andria, in the isle of Lesbos, at Napea, at Messa and at Mityl-
ene, formed the structural support by carving in an oblong bl-
ock a very much conventionalized image of a flower, in which
two divergent and involuted sepals enclosed a group of petals

arranged in form of the palmatium.(239,1,2).

This type is rich and grand in effect, but relatively difficult in execution, was in competition with another -- very characteristic specimens of which have been found at Delos and at Athens -- which was only an economical imitation, and which was superior to it from the structural point of view. It was an oblong prism, whose narrow ends presented the roundness of a cylinder -- they are termed bolsters,-- while on each longer face an engraved or painted line represents the scroll of a v volute.(239,8,9,10).

These three happy arrangements are not at all unknown to us, for we have met with them in Egypt, Assyria, Phoenicia, and among the Hittites of Cappadocia. [1] (239,4-8,11-13); fertilized by Hellenic genius, they gave birth to two masterpieces of architectural sculpture, the Ionic and the Corinthian capitals.[2]

Note 1. See Figs. 55; 89,1; 98,7; 111.

Note 2. See pages 365-368.

Yet at the same epoch, the favor of Ionian architecture also passed to a capital fashioned like a basket of leaves or as a bell, of which we shall speak soon. [3] In the course of the 6 th century, it was thought to place on it the rustic cap, as described in the last place, and in relation to which it assumed the role of cushion or of echinus. Only, the abacus lost in height until it took the appearance of a slab, beyond which the bell widely projected. The reality and the form of this combination have been revealed to us by the very characteristic conformation of several capitals from Delos, and the Acropolis of Athens, of those of the first Artemesion of Ephesus,
357 of that of the Golumn of Naxos at Delphi etc.(239,14-17).

358 Then came refinements, The cushion was relieved at its ends
359 by the insertion of an abacus between its top vertically above the echinus and the underside of the entablature, impressing on it an appearance as elegant as expressive of its twofold r role of structural intermediate and sculpture, that of an elastic and flexible slab. A first means was to cut a "groove"on the edge, that also offered the advantage of recalling the flutes of the shaft; a second was to suggest the idea of a spring acting under a load by fashioning the middle part in the f form of an arc opening upward, as if it had bent under the pr-

pressure, with hanging ends in spirals, as if they were drawn by their weight.(236; 244).

In the shadow cast by the entablature, the round of the cushion, if it had been left continuous and plain, would have constituted a soft form, even an uncertain one. They did not fail to model it, either by grooving it with vertical channels, that also rendered the service of recalling the flutes of the shaft, or by reducing the bolster at the middle, variously treated by sculpture.(164; 239;9,15,16).

An ingenious artifice solved in very elegant fashion the difficulty resulting from the fact, that at the angle of a portico in the Ionic style, the last capital of a facade presented a bolster on that at right angles, instead of the two normal volutes.(241). It was thought to continue this troublesome b bolster under the architrave in return -- which gave in front one of the two volutes necessary; to fashion in its place a p portion of the bolster; finally to represent the second volute on a sort of horn in the form of a vertical disk, projecting diagonally from the capital; at the other extremity of this t the intersection of the bolsters forms a reentrant angle. At the beginning of the last third of the 5 th century, the application of this arrangement to the four sides of the capital c created a new type on a square plan, examples of which are furnished by the Temple of Phigalia and the Theatre of Epidauros,
360 but which did not dethrone the traditional shape.

This further admitted complications; such as the insertion of a moulded cushion with a torus profile between the abacus and echinus, and between the latter and the shaft; such again was the modeling of a high collar at the top of the latter -- both observable on the northern portico of the Erechtheion. (244).

More than the Doric, the Ionic capital was affected by the evolution of the Grecian orders in the sense of a greater slenderness. At first, its part in the total height of the column diminished in much greater proportions. [1] Besides its sculpture was the object of various modifications, with the view of developing in the spectator the impression of an increased slenderness of the support; at first this was an enlargement of the top of the abacus,[2] that Ictinus tried at the Temple of P

Phigalia, evidently with the view of raising the eyes (242,5); then -- witness the order of the Temple of Athena at Priene a and that of the Philippeion of Olympia -- this was an extreme thinness of the slab (242,2,3; 238); finally this resulted in the suppression of the border marking the lower edge of the s slab.(242,4).

Note 1. The capitals of the Didymeion are one third as high as those of the Propyleion of Athens, while the Doric capitals of the Temple of Nemea are only half as deep as those of the Parthenon, although for both the chronological interval may be nearly the same. (Athena Nike, 1\11; Erechtheion (east) 1\12; Propyleion, 1\14; Aezani, 1\25; Didymeion, 1\33).

Note 2. Compare the curious resemblance of this conformation and of the outline of the Hittite capital.(Fig. 98,7).

The Entablature. -- The Ionic entablature is distinguished from the Doric by more simplicity in composition and less freedom in form; indeed it comprises as essential elements only the two indispensable members, the architrave and the cornice, and as the rule for careful edifices, when it inserts between them a frieze, this betrays its structural uselessness by the absence of all modeling of a monumental order; on the other h
361 hand, it multiplies the divisions,and it softens the accenting of the profiles.(229; 236; 243; 248). 2

The Architrave. -- Its front surface is accented by the projection, twice and often thrice repeated, of bands slightly p projecting beyond each other. As in the Doric style, its upper limit is distinctly marked by a relief of a moulding; but this is profiled in ogee form.

Lower than the architrave -- the difference equaling a fraction of the latter varying between 1/12 and 1/4 -- the Ionic frieze forms a band, sometimes plane and sometimes sculptured -- as at the Temple of Athena Nike (164; 229; 236; 243); indeed a sort of diadem on the facade of the edifice.

By its general form, the Ionic cornice approaches the Doric; what differentiates it are the peculiarities of the secondary relief. The principal one consists in the mode of joining the soffit of the cornice to the face of the entablature; it was most frequently realized by means of a simple ogee moulding ((201,8; 229; 236), also sometimes -- witness the caryatid por-

portico of the Erechtheion (254) and numerous examples presented by the monuments of Asia Minor, Priene, the Didymeion etc.
362 -- by the aid of a row of dentils, i.e., by projecting rectangular blocks regularly spaced according to their width and projecting beneath the cornice like the projecting ends of the j joists of a covering. (210,3,5,6; 243).

As for the pediment, it is distinguished from the similar D Doric one only by its smaller height, which does not exceed 1/8, and frequently from the 4 th century even 1/10 of the length of its base. (220). In the case when the cornice of the entablature comprises dentils, these quite frequently appear beneath the inclined cornice.

III. Different Styles.

I. Columns with Capitals in form of a Bouquet or Bell.

The Corinthian Formula.

To the relief formulas of the Doric and Ionic orders, Grecian architecture associated in all epochs, though in a lesser
363 degree, a third one, differentiated from them both by its general form, which is that of a basket, and by the details of i its moleding, that reproduces appearances of a plant nature.

It otherwise conceives several variants, that may be classed in three categories.

Types in Form of a Bouquet.

A first one is characterized by its resemblance to a bouquet of regular composition and groups two different types, one stumpy and the other slender.

On the one hand is the relief of sometimes one but more frequently two rows of leaves, these being smooth or goffered, s slender, oval or square; sometimes all are recurved or scrolled; sometimes with two rows, the upper one inclined and the l lower one upright, in the image of the petals and sepals of an expanded flower. The last arrangement as noted later, obtained the favor of the Doric style for the cornice of a wall. Specimens of this kind of capital exist for all epochs of Hellenic architecture.[1] Its oriental origin is certain, being attested by a striking relationship with Egyptian, Phoenician or Assyrian motives (245,4-6).

Note 1. 7 th century, ruins of Neandria; 6 th century, Temple of Naucratis; 6 th - 5 th centuries, votive Column of Esc-

Eschines at Athens; Hellenistic epoch, Aegae (245,1-3).
364 The slender type (to it is applied calathos, the Grecian na-
me of a basket) is either in the image of a group of palm lea-
ves -- this is the case of the capitals discovered at Delphi,
and at Pergamus in the ruins of the Temple of Athena Polias (
(4 th century) (246,1,2), or that of a tuft of acanthus leaves,
like the finial of the Monument of Lysicrates (190) and the c
capital of the votive Column of the Dancers at Delphi (246,3).
Its affiliation is evident; it is a replica of the capital of
palm shape, that Egypt loved in all epochs, particularly in t
the Saitic, which was precisely that of its first relations
with the Greeks (246,4).

Type in Form of a Bell.

The second sort is characterized by the resemblance of its
form to that of a bell with projecting square cover, surround-
ed by two rows of leaves, one closely applied to its surface
365 and extending to its top, the other recurved at top and limit-
ed to the lower zone. The foliage of the former is always lan-
ceolate, while that of the second is of the same species -- t
thus at the Tower of Winds at Athens (247,1), sometimes that
of the acanthus, as the case for a votive column found at the
Theatre of Dionysos in the same city (247,2). It is again on
the banks of the Nile, by passing through Cyprus, that ends t
the search for the origins of this type; for it repeats that
of the bell form, excepting the two differences of execution
in relief decoration, that Egyptian art limited itself to imi-
tate by painting, and the addition of a projecting slab.(247).

The Corinthian Formula.

The third class, last to be cited in chronological order, b
but whose fortune was by far the most brilliant after the 4 th
century, is that of the Corinthian capitals. First employed f
for internal colonnades, it was presented on the facade by the
declining Hellenistic architecture, notably at the Temple of
Zeus at Labranda and the Olympeion of Athens (166).

If we credit Vitruvius, the Corinthian capital owed its exis-
tence to the invention of Callimachos, a goldsmith at the end
of the 5 th century, a native of Corinth, the same who fashio-
ned the golden lamp of the Sanctuary of Athena at the Erechth-
366 eion. [1] The truth is, that it was known before the era of Cal

Callimachos, since about 430, Ictinos chose it for the capital
of an internal column of the Temple of Phigalia, and that with-
out mentioning the striking analogy of its forms with those of
367 certain Egyptian types, [2] it was quickly recognized as a hybr-
id, combining with the characteristic elements of the bell ty-
pe the volutes and the palmatium of the primitive Ionic formu-
la of Asia Minor (249).

Note 1. According to a graceful legend, it was inspired by
the sight of a tuft of acanthus leaves on the grave of a young
girl, enclosing a basket with a projecting cover, that forced
the leaves to become recurved.

Note 2. See Figs. 55; 56,8-10; 58,10-13).

Further, several varieties are known, that may be placed in
two series, each divisible into two groups.

The first is characterized by the preponderance of the volu-
te element; sometimes -- as proved by examples furnished by t
the Temple of Athena Laphria at Messene and by the Palestra of
Olympia -- it comprises but a moderate height (249,1); more f
frequently -- witness the capital of the Temple of Phigalia --
it admits a height almost doubled, and it fills the space bet-
368 ween the angle volutes by means of a pair of reversed scrolls
supporting a palmatium.

On the contrary, in the second category, the foliage domina-
tes to the point of sometimes -- as observed on the Philippei-
on of Olympia -- requiring a formation of the volutes as spra-
ys of acanthus and the sacrifice of the inner scrolls (249,3).
These always persist in the normal arrangement illustrated by
the masterpieces realized by the Tholos of Epidauros, the Mon-
ument of Lysicrates, and by the Olympeion of Athens.(249,4,5;
248; 250). From the 4 th century, two improvements were made
in the shape of the abacus, which made it accord with the gen-
eral outline of the bell; its ogee profile and the concave cu-
rve of its sides, generally accented at the middle by a palma-
tium or the image of a fruit.

Grecian architecture did not feel the need of creating a th-
ird order, and when it employed the Corinthian capital, it bor-
rowed the remainder of the elevation from the Asian variety of
the Ionic style; such as a shaft channeled by 24 flutes, an A
Attic base on a square plinth, and an entablature in three pa-

parts with a dentil cornice. The proportioning of the elements was similar, [1] but their relief comprised difficulties; the diminution of the shaft was less and its entasis less evident; the cornice was sometimes -- as observed on the Temple of Claudius Caesar at Ephesus -- was supported by a series of consoles (251,5); especially the frieze was lower and was distinguished by a wavy profile, seen as a sketch on the Tholos of Epidauros and in the very free examples on the Temple of Labranda, the Temple of Claudius Caesar at Ephesus, at Salonica etc. (251,2,3,4). A peculiarity -- notable on the "Column of the
369 Dancers" discovered at Delphi, on fragments uncovered at Athens, and on the representations by paintings on vases -- is a curious naturalistic conformation of the shaft in the image of an articulated stem with rows of acanthus leaves, at the bottom of the trunk and at each reduction in diameter.(189). As for the ante, its appearance is sometimes that of the end of a wall in the Ionic mode, sometimes -- thus on the Monument of Ancyra (252) -- that of a pillar with capital, and sometimes that of an engaged column, as at the entrance of the Stadion of Olympia.

Note 1. Ratio of diameter of column to its height.

Olympeion of Athens	1 to 8.82
Temple of Labranda	1 to 9.50
Temple of Claudius Caesar at Ephesus	1 to 10.50
Choragic Monument of Lysicrates	1 to 10.70
Diminution per foot in height.	
Choragic Monument of Lysicrates	0.004 inch per ft.
Olympeion of Athens	0.0044

370 II. The Pier. The Caryatid.

To the rule of the formation of the isolated support as a c column, Grecian architecture presents two exceptions.

The Pier.

The first, examples of which may date from the 4 th century and are furnished by the Monument of Thrasyllos at Athens, the propyleion of the Temple of Athena at Priene, and doubtless a also by the Arsenal of the Piraeus -- resulted from the use of piers shaped like an ante of the Doric or Ionic with very slender proportions (253; 219,12). Their faces were sometimes fluted; they were sometimes decorated by an engaged column, as t

the case in the Hall of the Bulls at Delos, and sometimes by a figure sculptured in more or less high relief-- witness the Incantada of Salonica.

The Caryatid.

The other type, which was in favor in all epochs of Grecian architecture, and whose most celebrated works belong to the Treasury of Cnidos at Delphi and the porch of the Erechtheion (163; 254), is the caryatid, a statue of a woman standing, on the head of which an imitation of a basket expands after the manner of a capital. Admirably claculated to give to the mind the ideas of strength, of ease and of unity, and to the eye a dominant impression of verticality, the sculpture of the caryatids of the Erechtheion is as architectural as statuary, an alliance of pleasing and expressive human appearance and with the exercising of a structural function. Equal praise is further merited by the colossal figures 25.2 ft. high, and cut in 12 courses of the wall, which took the part of consoles at the Olympeion of Agrigente.

371 Chapter 7. The Effect.

III. Effects of Ornamentation.

At all epochs in its history and in whatever style it built,
Grecian architecture loved the luxury of ornamentation. Two
distinctions are always imposed; very vivid in the primitive
epoch, restrained in the second half of the 5 th century, the
taste for this sort of effect was regularly developed after t
the 4 th century, a little more in each generation, until the
errors of the passion; on the other hand, it was more essenti-
372 al to the Ionic mode than the Doric, and still more for the C
Corinthian than the Ionic.

Effects of the Material.

And first Grecian art sought for the appearance of materials suited to please the sensuality of the age. Every time that it was able, it constructed entirely in marble, and if necessary to satisfy itself with materials of poor appearance, it d did not fail to mask them by a covering. Ordinarily this was a coating of stucco composed of gypsum and marble dust, possessing rare solidity at the same time as susceptibility to the most beautiful polish. In the primitive times, particularly in Sicily and Magna Grecia, they still loved to cover the upper parts of an edifice -- the most apparent in both stone and wood -- with facings of that dense and smooth terra cotta, that Hellenic industry excelled in manufacturing, notably at Corinth (255). Thus it occurred -- this was the case for the f first Temple on the Acropolis of Athens and for that of Zeus at Olympia -- that a monument in limestone was crowned by a c cyma and tiles of marble (256; 257).

373 II. Effects of Color.

Yet however precious the material and however perfect its treatment, the Greek was not at all satisfied, if it was not coquettishly painted in brilliant and varied colors.

Long unperceived, contested in principle by northern esthetics, when this did not take into account the difference in climatic conditions, the polychromy of the edifices was in all epochs one of the fundamental rules of Grecian architecture, and a well informed judgement does not criticize this. Indeed by reason of the brilliancy of the light and the vivid reflections, of the vigorous coloring of the sky and of the landscape

and the delicacy of the ornamentation on even the higher parts, it was for Grecian architecture a matter of necessity, as much if not more, than of taste. Doubtless -- all their artistic productions fully attest this -- the Greeks adored color; but in this case it was indispensable to them to ensure the freedom of the monumental outline and the visibility of the details in relief, as well as to avoid a violent contrast -- antipathetic to their eyes, smitten with harmony -- of a cold whiteness
374 of stone with the warm tones of the surrounding sky and earth, as also of a strong shadow with the sparkling clarity of a part of the stucco or the illumined marble.

It was not to a natural polychromy, to a combination of stones of different tints, that the favor of the Greeks passed. Very rare are examples of marquetry in stone. Athens offees some to us; the construction, by means of the blue marble of Eleusis, of a background for the figures of the frieze of the Erechtheion, a threshold in the transverse wall of the Propyleion, an architrave for the windows of the Pinacothek etc.

On the other hand, they voluntarily utilized metal, either making of bronze an accessory part, such as the cresting of t the Philippeion at Olympia, which imitated a poppy flower, or again the shields sometimes fixed on an architrave, or rather -- which was current practice in the Ionic style -- that the projections of an ornament were gilded.

But it was substantially from painting, that the Grecian architect demanded his effects in polychromy; he employed this to coat the surfaces, to illumine the reliefs, as well as to define the form of an ornament or of a figure.

The processes were various. Operating on stucco, the color was sometimes mixed with stucco during its preparation, and sometimes it was mixed with a vehicle and spread over the surface of the coating while still fresh or already dried. Was this of marble, it received the impression of the color by the encaustic process used hot. Frequently the places to be tinted were not the object of any preparation; they were generally defined by an incised line, and sometimes even slightly sunken; the adhesion of the painting to the marble was favored by roughening it.

As appropriate, monumental Grecian polychromy admitted only

flat tints, frank tones, harmonies very simple and vigorously contrasted, notes clearly defined by bordering or dividing lines. As for the tones, each of the great epochs of the architectural history of Greece had its own taste; very warm in the 6 th century, they became lighter gradually after the 5 th; t the fact that this evolution of polychromy corresponds chronologically with the substitution of marble for terra cotta for the roofing, induces one to think the former in good measure a result of the latter.

325 The palette was very limited. The ceramist only charged his own with yellow ochre, reddish brown, black and a little white; the painter particularly employed blue, red and yellow.

It is not agreed in regard to the proportion in which the e elevation od a Grecian facade was illuminated. Was this confined to the upper portions, or did it also extend to the walls and the columns? Was it less when the edifice was of marble, than when it was of stone covered by stucco? What is certain is, that its part was greater when applied to the Doric style than to the Ionic, which employed sculptured decoration far more than the former, and more considerably in the monuments of the Ionic style, than in those according to the Corinthian formula, of all most lavish in sculptured ornamentation. On the other hand, it appeared well, that for reasons of harmony all white was proscribed, and that marble as well as stucco s should be slightly tinted yellow, the latter by a tint and the former by the application of hot wax, the last further having the useful effect of waterproofing to a certain extent the surface of the stone.

On a Doric elevation, the distribution of the tints appears to have been guided in a general way by the twofold desire to accent the principal lines of the monumental relief and to harmonize a rhythm dominated by a play of red and blue. [1]

Note 1. This was from the bottom upword:-- first a yellow ivory tint, more or less warm, broadly applied on the walls a and columns. Then a row of red bands extended by the illumination of the hollows of the annulets of the capitals; then the yellow band of the face of the architrave; above and on the b band crowning this, ran a red stripe underlined by a blue line, that formed below each triglyph the edge of the regulo support-

supporting the drops; above a series of large spaces, alternately either of blue and of yellowish white, or of blue and red; the first harmony corresponding to the contrast of the triglyphs with the plain metopes, the second to that of the triglyphs with the painted grounds of the sculptured metopes; higher, the mutules formed a series of squares alternating with the r red parts offered by the grounds of the separating channels; at the top triumphed the red on the blue, with which was colored the background of the tympanum. Finally, the drops scattered spots from place to place, generally red, sometimes of yellowish white and even gilded.

376 More reserved and essentially required by the desire to enhance the detail of the decoration, the polychromy of an Ionic elevation substantially consisted of impressions of red or of blue on recessed parts, and of gilding and enamel on the reliefs. As for the Corinthian order, its ornamentation was especially metallic, composed of lights in gold and the application of motives.

Necessarily, for positions less lighted -- ceilings of porticos and internal surfaces,-- the note was more brilliant, the tonality lighter, the scale more variegated. For these were put under contribution rare woods and costly stones, particularly in the Hellenistic epoch.

III. Effects of the Relief Order.

Yet the Hellenic architects possesses to a too high degree the feeling for suitability, to not prefer in monumental ornamentation that of the relief kind.

Doric Style.

For the latter the Doric style assigned quite strictly the place. And first in what concerned the column, it may be said that nothing was accorded to it, for at most the archaic epoch offers some specimens of gorges enriched by petty reliefs and of grooved abacuses.[1] (226,1). Similarly for the architrave; save for the only exception presented by the ancient Temple of Assos, the surfaces remained smooth. At two extreme epochs in the history of the order, the forms of the triglyphs are sometimes complicated by several lights, such as from mouldings, as at Temple C of Selinonte; motives treating the tops of the

377 chamfers on the angles -- as seen on the Temple of Dionysos at

Pergamus; projection of a relief shaped as figures of bulls, as the case at Delos, or in the form of emblems, as at Eleusis. Plain metopes did not shock the Greeks; they freely ornamented them by applied decoration in terra cotta or carved in solid stone; sometimes all of them -- witness the Parthenon -- more frequently only a portion, benefiting by thet distribution of the ornamentation. At first very much carved, particularly in case of a terra cotta covering (255), the cyma of the cornice no longer comprised more than a painted decoration after the classical epoch (225; 227). It was the same for the cap of t the wall;only the mouldings of the head of the ante were susceptible of sculpture, for example as may be verified on the P Parthenon. With the metopes, the tympanums of the facades were the oly portions of a Doric edifice ornamented, occupied as they were by a display of statues (213).

Note 1. Let us cite the columns of the Temple of Demeter a and of the Basilica at Paestum, of the Treasury of Syracuse at Olympia, and of a funerary Column of Corcyra.

Ionic Style.

On the contrary and particularly in Asia Minor, few elements of the Ionic order did not permit a richly sculptured ornamentation. Plinths and caps of the wall were equally accented by reliefs or carvings, and the north doorway of the Erechtheion shows, that the architrave of an opening offers the appearance of goldsmith's work in stone (262); sometimes the toruses of the bases of columns, and the deges of certain plinths were covered by embroideries and even figures; [1] a collar with num-
378 erous and various details surrounded the tops of certain shafts, [2] while others showed flutes enriched by simple motives.[3] Many times the echinus was embossed and engraved, while jewelry in stone or metal was scattered in the flutes, [4] on the volutes, on the bolsters, [5] and on the abacus of the capital. Ornaments always embellished the band crowning the architrave,[6] often the projections of its bands, [7] sometimes its front surface, [8] and even its soffit. [9] The treatment of the frieze is sufficiently characterized by the terms designating it, that of decoration-bearer (cosmophore) or figure-bearer (zoophore). The cornice was also sculptured on the cyma, on the surface of the facia, on the grooves of its soffit, on the fronts of the

dentils (229; 236;243). As for the tympanums of the facades, we have no evidence that they sheltered statues, and it is q quite probable that they remained vacant, in case the frieze was animated by figures.

Note 1. See the toruses of the north portico of the Erechtheion, the facades of the Didymeion and of the Artemesion of Magnesia; the plinths of the facades of the Didymeion, the bases of certain columns of the first and of the second Artemesion of Ephesus (235; 236; 234,5).

Note 2. See at Naucratis, Locri, the Erechtheion and Magnesia on the Meander (244).

Note 3. See Temple of Zeus at Aezani, where vases were sculptured on the fillets of each flute.

Note 4. See at the Erechtheion, Samothrace, and Temple of Apollo Smintheus in the Troad.(244; 238).

Note 5. See at Magnesia on Meander, Pergamus, Propyleion of Priene, Salamine in Cyprus, Temple of Julius Caesar at Ephesus.

Note 6. See Didymeion, Artemiseion of Magnesia, and the Great Altar of Pergamus.(236; 243).

Note 7. See at Priene, Magnesia and Pergamus.

Note 8. See at Erechtheion, porch of caryatids.(254).

Note 9. See at the Propyleion at Pergamus; portico of Temple of Athena Polias, Didymeion, Erechtheion, and Temple of Athena Nike.

Finally, to the use of the Corinthian capital corresponded a real profusion of all ornaments of which an architectural m member is susceptible.(248; 252).

Whatever the order selected, the beams, coffers and slabs of the ceilings received a sumptuous decoration by varied sculptures.

IV. The Style.

In a general manner, the modeling of this secondary relief manifested that certainty of taste, proofsc of which abound in the preceding Chapters; the relief is always proportioned to the place occupied by the motive, to the lighting received by it, as well as to the distance from the point of view; low on a frieze, high in the recess of a metope, absolute in the recession of a tympanum. Always from the 4 th century, monumental sculpture was evolved in the same, both of an accenting of

the projections and recesses, and of a broader and more nervous composition. [1]

Note 1. For example, we may take as terms for comparison, the north facade of the Erechtheion, the Temple of Tegea, the Didymeion, and the Great Altar of Pergamus.

V. The Motives.

Geometrical figures, images of objects, of plants and animals, of human forms, all the categories of motives usable for
380 decoration, Grecian architecture put under contribution. Important in archaic times, the vogue of the former diminished f from the end of the 6 th century to the profit of the floral elements, which in their turn found competition in a certain measure, particularly from the 4 th century, by those derived from animated nature.

Geometrical Ornament.

Geometrical ornament substantially constituted the current decoration. It did not comprise numerous varieties. In the order of frequency of use were:-- a row of spherical or oblong beads separated by disks set edegwise, by which bands and astragals were relieved (261,13,14; 263); the fret, determined by regular revolutions, usually angular but also sometimes curved, a line or narrow band, sometimes interrupted at equal intervals, but more frequently continuous (261,9-11; 248; 252); the interlaced band arranged in various ways, which obtained the favor of the 4 th century, as well as that of the 6 th century (261,12,15; 265); the cable and the twisted fringe. The geometrical kind equally had its place in the covering ornamentation. The archaic epoch loved the chessboard of squares or rectangles, scrolls, and to a lesser degree chevrons (256), in a all times groups of lozenges were the fashion; [1] less was the vogue of cruciform or star arrangements (261,29) and of scattered disks, as may be seen at the Erechtheion and on the architrave of the porch of the caryatids.(261).

Note 1. See at Olympia the Treasury of Gela (4 th century), the Philippeion (6 th century); at Pergamus, the Temple of Dionysos (Hellenistic epoch).

Plant Ornament.

It was particularly by the plant kingdom that monumental Grecian decoration was inspired. The preferred motive was the

palm leaf, whose shape was often exquisite and was employed c
currently for the fashioning of acroterias, antefixas and roof
crestings, [2] frequently at a very large scale, as well as for
the execution of a running ornament on the ground of a cyma, a
frieze, a band or a cornice (261,23,24; 244; 263); in the sec-
ond case, it frequently alternated with a bouquet of the lotus.
(263). It divided the favor of the Greeks with a series of f
falling narrow leaves, very much conventionalized and goffered
381 in form, alternating with partial ovals, termed eggs, or with
382 triangles, called heart leaves (261,17,18; 263). In the third
rank may be cited the conventionalized image of the lotus bud
or flower; somitimes it alone formed the running decoration --
sometimes alternately upright and pendant --; it was also som-
etimes partly connected with the palmatium, to compose a hybr-
id or to arrange a composite series (261,20-24). Then came t
the rosette, at first simple with petals in small number and
slightly treated (261,25; 256), later complicated by a multip-
lication of rays and a differentiation of the form; they were
either employed in a series on bands -- such as that inclosing
the north doorway of the Erectheion--, or isolated and realiz-
ed in large proportions on the metopes, for example, as on the
Tholos of Epidauros (261,26).

Note 2. See the acroterias of the Temple of Egina (259); of
the Leonidaion at Olympia; of the Trajaneum at Pergamus.

The Hellenistic epoch again loved the acanthus scrolls, a p
picturesque arrangement of the stems, leaves, flowers and even
fruits of the plant, developed on the frieze with a harmonious
balance of scrolls and of divergent branches (261,28; 243; 252).
Alexandrine art created the vogue of the garland, [1] sometimes
conceived as a rather loose tress of diversified elements, so-
metimes as a sort of continuous pad of imbricated laurel leav-
es; to this second type belongs some toruses of bases and num-
erous cushions of Ionic capitals. [2] (261,28; 235; 262). The
Doric style, in accord with its severity, comprised the more
simple arrangement of rows of recurved leaves of nearly recta-
ngular form, and the arrangement of lanceolate leaves with ro-
unded ends (261,16,19).

Note 1. For example, see those shown by the entablature of
the Temple of Athena at Pergamus, which may be dated from the

first third of the 2 nd century B.C.

Note 2. See for toruses, the colonnades of the Didymeion, Magnesia, Priene and Labranda.

The Animal Motive.

The appearance of the animal world never inspired monumental Grecian decoration, except in very restricted measure. Those most commonly employed were the lion's head for spouts of gutters (225; 236; 257; 260); the bull's head for the projections of the frieze, triglyphs,or the bolsters of Ionic capitals; (243); the forepart of the animal for the last purpose, [3] and also for the forms of corbels; [4] its entire outline to animate
388 the band of an architrave. [5] Let us add, in spite of their rarity, the image of the eagle, [6] and the representation, offered in the ancient Temple of Apollo at Delphi, of a combat of lions, bulls and stags. To this category are attached the fanciful forms of the griffin, frequently chosen for the form of
389 the angle acroteria or to animate the surface of the capital of a pilaster, by two monsters facing each other on each side of a plant motive (232). [7]

Note 3. See Temple of Claudius Caesar at Ephesus.

Note 4. See at Delos.

Note 5. See at Assos.

Note 6. See the frieze of the portico of Athena Polias at Pergamus.

Note 7. See on Temples of Athena at Priene and of Apollo at Pergamus.

The Human Motive.

In all epochs, the human figure was an essential element of the ornamentation of a Grecian monument.

At first and everywhere, it was assigned for significant representations, to that sort of niches formed by the tympanums of facades, the Doric metopes (213) and the panels developed by friezes (229; 236). The subjects were borrowed from mythology, heroic legends, and exceptionally from religion. Frequently it was the scene of a struggle; combat of the gods and t the giants, [2] of the centaurs and the Lapithae, [3] of the Greeks and the Amazons, [4] of the Greeks and the Trojans, [5] of Greeks and Persians; [6] or again the subject was an assemblage of the gods, [7], a divine or heroic story particularly interesting

to the city, [8] a ritual scene like the Panathenaic procession, that extended on the frieze of the Parthenon.

Note 2. See the eastern metopes of the Parthenon; the frieze of the Great Altar of Pergamus, and the northern frieze of the Treasury of Cnidos at Delphi.

Note 3. Western pediment of Olympia; western frieze of Theseion (213); southern metopes of Parthenon; Temple of Phigalia.

Note 4. Temple of Phigalia, Artemeseion of Magnesia.

Note 5. See Temple of Aphaia at Egina.

Note 6. See the west, north and south sides of the frieze on Temple of Athena Nike (164).

Note 7. See detail of the frieze of the Parthenon; eastern side of the frieze of the Temple of Athena Nike (164); frieze of Treasury of Cnidos (163).

Note 8. Thus on the eastern pediment of the Parthenon, the birth of Athena, and on the western tympanum of the same temple, the contest of the goddess with Poseidon on the subject of the patronage of Attica; on the eastern pediment of the Temple of Zeus at Olympia, the preparations for the race of Pelops a and Oenomaos; on the northern and southern metopes of the Theseion, the exploits of Theseus.

On the other hand, the human form contributed to the decoration, properly so-called, sometimes presented alone, sometimes associated with ornamental motives. Thus the apex acroteria at the Temple of Egina was composed of a palmatium flanked by two female statues (259); on the Temple of Zeus at Olympia, of a victory; at Metaponte, a head within a circular medallion; at the angles of the pediment of the Asklepion of Epidauros r rose Nereids on horseback.(163). Thus again, images of the g geniuses frequently animated the capitals of antes or of pilasters in the Ionic or Corinthian styles,, [9] and it was not exc-
385 eptional, at least in the Hellenistic epoch, that from the eye of a volute or even from the end of the bolster of an Ionic c capital projected a head in high relief. [1]

Note 9. See Temple of Ancyra (252) and the Didymeion. Also certain bases of the Didymeion (235).

Note 1. See the order of the facade of the Didymeion (243).

Various Motives.

Finally, Grecian monumental decoration employed representat-

representations of objects. Thus -- for example at the great Temple of Olympia -- a tripod formed the acroteria at an angle; it was also composed of trophies, such as decorated the balustrade of the portico of the Temple of Athena at Pergamus (167'; it carved the image of a vase in the hollow of a flute, as observed at the Temple of Zeus at Aezani.

326 VI. Decoration of the House.

The ornamentation of the Grecian house was in due proportion in the image of that of the monument. Such as revealed to us by the houses of the Hellenistic epoch discovered at Delos, T Thera and Priene, it was composed of marble parts, shown by t the columns of the portico, by the jambs of the doorways and sometimes by the walls, and by coatings of stucco embellished by paintings and by ornamentation in relief. The note of the polychromy first appeared on a high plinth of dark color, reddish-brown, dark blue or black; then on a zone of panels often enclosed by borders, colored in light tints and sometimes enlivened by representations of flowers AA in bouquets or garlands, or even by small figures; finally, on a frieze, which was composed of bands of red and blue, or of yellow and brown. T The relief decoration consisted of Doric friezes, cornices, consoles, ox-skulls and masks. The effect of color was completed by the variegated pavement, which was sometimes a regular pattern of squares of different marbles, sometimes a mosaic, more or less variegated.

387 Book IV. Eclectic Architectural Styles of the Persian and Roman Civilizations.

At two extremities of the antique world, in the Persia of t the Achamenides and in republican and imperial Rome, architecture developed in similar historical conditions,and by analagous ways accomplished comparable destinies.

In both places, it was at the service of a people naturally energetic and rude, which after having long vegetated in a rustic mediocrity, after a great struggle won supremacy over ancient and more civilized nations, being in turn conquered by t their civilization.

Just as the Persians, conquerors of the Mesopotamians, the Egyptians and the Ionians of Asia Minor, demanded instruction from them, after the Romans had triumphed over the Etruscans, the Carthaginians, the Greeks and the Orient, they placed themselves in their schools.

Thus the Persian and Roman styles of architecture resemble each other in this, that bort are derivatives, they again have this in common, that neither falls into a servile imitation. First, they did not proceed by mechanical repetition in general, but by thoughtful borrowing of elements; further, far from binding themselves to a single model, they practised an eclectic cultivation of all styles seen by them, and since they had energy and temperament, they knew how to realize some new combinations, several even being tasteful; finally, since they necessarily participated in the strong individuality of the n nations, that served them, they marked their productions with their own character and the best with an incontestable originality.

Let us add, that they shared the honor of having been imitated in their turn.

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388 ## Part I. The Architecture of Persia of the Achemenides.

The primitive architecture of the Persians began late, at t the beginning of the 6 th century B.C., and its career was brief and terminated at the beginning of the last third of the 4 th century by the conquest of Alexander, at the same time as the end of the Achamenide dynasty. Its mature phase had lasted a little more than a century. [1] Its area is a long band extending from northeast to southwest, between the table land of Iran on the one hand, on the other being the Mesopotamian plains and the Persian gulf. The vestiges of its productions are not numerous, but their existence is sufficiently explicit, f for one to form a correct idea of its procedures and of its s style.

Note 1. We shall reserve for volume 2 of this history the examination of the vaulted monuments of Fars (edifices of Firouz-Abad, of Sarvistan etc.). In spite of the legitimate authority of the opinions of M. Dieulafoy, who has studied them, they do not appear to us to be attributable to the epoch of t the Achamenides. There are too many examples of the survival of ornamental formulas of the art, which created them, for us to accept his reasoning, substantially founded on the existence in these ruins, of motives characteristic of the primary architecture of Persia.

Chapter 1. The Demands. -- Monmumental Chronology and Topography. -- Physical and Human conditions.

The human and natural conditions of its development were not very brilliant.

I. The Requirements.-- Monumental Chronology and Topography.

And first it received but a very small number of demands of a funerary character, and it knew of no religious demand whatever.

389 The Persian faith required that the corpse should be destroyed by carnivorous animals, so that its impurity should neither pollute the earth, the water, nor the fire, thus there was no need for a tomb; places for exposure sufficied. But for t the superhuman nature attributed to them, the kings always had a right to burial, which must be conducted in a manner corresponding to their elevated dignity.

The religion of Zoroaster had small need of assistance from

the art of building. Doubtless Herodotus is mistaken in stating that the Persians had not been accustomed to erect statues, temples or altars to the gods, and that they regarded as fools, those who did so. But since the esoteric worship of Ahura-Mazda, of the good spirit, was reduced to the priests feeding the undying flame of a hearth, protected from natural and human impurities, and that the esoteric rites consisted in prayers and in sacrifices of horses and oxen on the high places, n nothing more was necessary than small sanctuaries and altars.

On the other hand, the primary Persian civilization was propitious to a brialliant flowering of civil architecture. Sovereigns, that could entitle themselves as kings of kings without lying, were counted among the most powerful, the richest and most luxurious of all time, and for each one of them were required magnificent palaces, specially erected for him, in t the measure of a semi-divine majesty.

Finally, the military character of the Persian monarchy and its extension by conquest favored a development of the art of fortification.

A primary demand came from the northern portion of the country under consideration, from Media, after its king Cyaxares h had taken Nineveh in 608 and had annexed Assyria. His capital, Ecbatana, seated in the place called Hamadan at the feet of t the Elvend, became a considerable city, with a palace, whose grandeur and luxury was clebrated by Herodotos and Polybius.[1]

Note 1. Herodotos, I, 98; Polybius, X, 27.

Toward the middle of the 6 th century, it became the turn of the southern region to dominate; under the Achemenide sovereigns -- Cyrus, Cambyses, Darius I and Xerxes, it became the centre of a vast empire, that in spite of an obstructed impetus marked by the defeats of the Persians at Marathon and Salamis, (490, 480), remained spirited and prosperous until its conquest by Alexander. (324).

Master of Ecbatana in 550, of Babylon in 538, absolute sovereign of immense territories, Cyrus (559-529) established the seat of his government at Pasargade, in the region now named Fars, north of Shiraz, in the plain of the elevated valley of the Polvar, at the place termed Meched Mourgab. Of this capital, which seems to have been rather modest, there remains me-

merely rare vestiges; altars, the terrace of a Palace, called by the natives Takt Madere Soleiman, i.e., "Throne of the Mother of Solomon"; three piers and one column permits the restoration of a Palace of Cyrus; a funerary monument is considered the tomb of the sovereign.

A second evidence is of quite other importance and is the g group of ruins a little lower in the same valley, which recalls the memory of the commands of Darius I (521-485), of Xerxes (485-472), and of their successors.

In the slopes of a spur of the mountains, naged Naksh-i-Rustem, four rock-cut tombs exhibit monumental facades, the most ancient of which is inscribed with the name of Darius, while at the foot of the cliff rise a funerary tower (fire temple ?) and two altars.

At the mouth of the river in the plain of Merdacht, the city of Istakhar retains portions of edifices and a fortified gate.

Finally and particularly at the place named Takt-I-Djemschid, on a vast terrace partly formed by the leveling of a rocky projection and partly by the construction of retaining walls bearing an inscription in the name of Darius, the ruins of Persepolis compose a grand entirety of monuments for habitation or ostentation, a Palace of small dimensions and a columnar hall called "Hall of a Hundred Columns", both designed for Darius; a great Columnar Hall, a Palace and a Triumphal Gate, attribu-
391 table to the reign of Xerxes; finally a third columnar Hall a and a third Palace.

A little farther south, Shiraz shows the remains of a royal Palace.

At Hamadan in Media, the base of a column recalls the exist-
392 ence of a Palace of Artaxerxes II; a precipice of Mt. Bissotoun or Behistoun near Kermanschah, dominating the great route from Ecbatana to Babylon, exhibits a great tablet cut in the rock, commemorating the glory of Darius.

Yet the true capital of the Achemenide empire was the old Elamite city of Susa, that the king of kings appreciated for the mildness of its climate in winter, and its fortunate strategic position, and where he received foreign ambassadors. The excavations of M. Dieulafoy have brought to light traces of f fortifications, the remains of a Palace of Darius I, burned a

about 440, those of a Throne Hall of Artaxerxes Mnemon (404-358), and parts of the ornamentation, all possessing the highest interest.

II. Physical and Human Conditions.

Excepting at Susa, the early architecture of Persia was developed in a mountainous country.

A climate with violent contrasts opposes burning summers to rigorous winters, and torrid days to glacial nights; it comprises hurricanes of unusual violence, abundant and prolonged r rains, with tempests of snow in the higher country.

From the point of view of the supplying the materials, Persian architecture was not spoiled by nature. Doubtless it found itself furnished with a very good stone, a compact limestone of yellowish or grayish color, stratified in very thick layers, permitting the quarrying of great monoliths. But rough and hilly ground, the steep slopes and the high altitude of the passes were opposed to transportation. The obstacles were the same in regard to timber, with which Persian construction was otherwise badly provided, because the extreme slopes of t the ground opposed the growth of great trees. Media, on the contrary, possessed great wealth of forests.

Human conditions were better. To the free labor of experienced workmen, attested by the engraving of mason's marks on the materials, the official architects could add the assistance of the labor of levies and of prisoners, furnished in abundance by a powerful and warlike royal government. Thus it again possessed the ability to import from afar and to raise up to Per-
315 sepolis or Pasargade the materials refused by the country, notably timbers of great dimensions and of precious species.

Originated late, after the flowering of the arts of Egypt a and of Mesopotamia; practised by a people of recent civilization; largely pupils of the Medes and the Mesopotamians; fatally beset by the view of the monuments of countries conquered by the "Great Kings" -- Mesopotamia, Egypt, Syria, Phrygia, L Lydia and Ionia in Asia Minor; finally, certainly affected by the collaboration of artists and of artizans imported from those regions, Persial architecture must be, and was strongly i influenced and eclectic. [1]

Note 1. In the course of our description, we shall state

accurately, as far as we meet with examples, the nature and m mode of these influences and affiliations. Let us note here, that they appear to have struck the ancients. We read in Diodoros of Sicily (I, 46, 4):-- "The Persians pillaged Egypt; a after having carried into Asia the riches of their temples, a and having taken there Egyptian artists, they built the famous palaces of Persepolis and of Susa". Recall that Nineveh was taken in 608 and Babylon in 538; that Egypt was conquered in 533; Lydia in 546; Ionia at the end of the 6 th century; that the Persians borrowed from the Medes their arms, military organization, their ceremonial and the costume of their kings, that they adopted cuneiform writing, and finally that Greek jewellers worked at Susa.

Yet the Iranian peoples, who practised it, possessed a stroong ethnic [2] individuality and an incontestable artistic activity, that preserved them from an exclusive, stupid and servile imitation.

Note 2. This survived the conversion to Islam.

Not only did they perfectly assimilate the borrowed elements, but even modified and recast them, and from the combination w with their own inspirations, they composed a very successful union of fine quality and grand appearance with very tasteful parts having a great effect, and which in turn became a model for India and eastern Asia. [3]

Note 3. See volume 2 of this History.

Chapter 2. Programmes and their Realizations.

I. Domestic Programmes.

The programme of a Persian palace, according to the mode in Mesopotamia, comprised the elevation of its site on a natural or artificial terrace, easily accessible by grand stairways.

In regard to the arrangement of the Persian harem, we lack information, the oriental method of constructing the private dwelling of crude bricks having destined this sort of Edifices to a speedy and complete ruin.

On the contrary, the arrangement of the royal apartments is revealed to us in sketched form by the Palace of Cyrus at Pasargade, and in completed form by those portions of the ruins at Persepolis, that pass for the remains of the Palaces of Darius and of Xerxes (266,5). A central columnar hall was intended for receptions, and was surrounded on three sides by rooms for various purposes, doubtless for use as offices and living rooms; on the fourth it communicated through five doorways with a double portico, that formed a monumental entrance to it, and which enclosed by two wings, utilized as guard room and waiting room. Perhaps it is necessary to see in this programme an extension of that of the Hittite and Assyrian hilani. (Pages 126; 152-153).

For solemn audiences the king of kings had at command vast throne halls designated by the name of apadana. Nothing does more honor to Persian architecture than these great structures. Square in plan, they were always preceded by a double portico, and often flanked by another on each lateral facade. Sometimes -- this was the case with those of Persepolis, where the w winter is rigorous -- they were entirely enclosed by walls of crude bricks pierced by great doorways,[1] sometimes -- thus at Susa where the sky is more clement -- they were open on the f front side, as they are against the "Talars" of modern Persia. (266; 267). (Volume 2). Indeed it was possible to enclose it at pleasure, as well as to subdivide it by means of those fabrics, that the Book of Esther (I, 5, 7) represents to us as" suspended by cords of linen and rings of silver from from columns", the taste for which and their manufacture have continued in the smae places until our time. The apadana was perfectly approproate for its purpose; thanks to its dimensions, to

the slenderness and wide spacing of the supports of its ceiling, it permitted a multitude to behold the sovereign seated at the end of the central aisle on one of the high platforms, whose image has been preserved to us by the monuments represented. So that the architecture of the Persia of the Achemenides proposed the primary solution for the problem of the assembly hall, which should be adopted by the Parthian, Sassanian, Roman and Christian architects. (Page 459 and volume 2).

Note 1. These walls have disappeared; but their existence is proved by spaces left in the pavement corresponding to their outlines.

The programme of a Persian palace comprised the construction of a great gate of honor, a specimen of which is presented by the "Propyleion of Xerxes" on the terraces of Persepolis. Its arrangement was borrowed from Mesopotamian architecture; on t the external and internal facades of a colossal structure of crude bricks, doubtless in the form of a group of symmetrical towers, were inserted two enormous stone doorways enclosures, giving access to a great internal vestibule, whose ceiling was supported by a group of columns.(265; 266,6; 267).

As for ordinary doorways, these were high and narrow openings, which were closed by porticos, rather than by leaves.(282).

Aqueducts and sewers extended in the ground. Gardens with basins were the necessary complement of every dwelling of some importance.

II. Military Programmes.

It was a very wise system of fortification, further derived from that perfected by Mesopotamian and Syrian engineers, which M. Dieulafoy has restored from the results of his excavations at Susa.(268). First was opposed to the assailants the f formidable successive obstacles formed by a wide moat filled with water, an embankment, an outer wall about 59 ft. high and 71 ft. wide, a space measuring 29.5 ft. high and 32.8 ft. wide, an internal ditch, a rampart of the same dimensions as the outer wall, a citadel, and finally a keep. Besides the most minute precautions were multiplied, to prevent approach and to thwart attempts by mining; battlements and balconies at the tops of the towers, casemates with shooting slots at Mid-height, permitting the command of the ground near as well as dist-

distant; the internal ditch between the second enclosure and the third, to better baffle mining works and the advance of t the adversaries, after mastering the first line of defense;
376 particularly zigzag lines and flanking towers, that suppressed the narrow passage.

The remains of a gateway near Istakhr give an idea of the a arrangement adopted by the military architecture of Persia to arrange and at need obstruct passage.

III. Religious Programmes.

The arrangement of the Persian sanctuary (ayadana) revealed by the excavations at Susa is well adapted to its purpose of protecting the sacred fire from any pollution and even all indiscretions.

On a platform elevated about 6.6 ft., the twofold obstacle of a rectangular enclosure and a series of corridors perfectly realizes the isolation of the sacred place, composed of a court and a holy of holies. This was situated at the rear of the former and opposite the entrance; it was a raised square chamber with its ceiling supported by four columns, preceded by a vestibule accessible by steps; at its centre was placed the hearth.(269).

As for altars in the open air, those preserved at Pasargade and at Naksh-i-Rustem near Persepolis, show that they were composed of a rectangular base about 6.6 ft. high, with a flight of steps at one side, and of a block with its top hollowed instead of a brazier.

378 IV. Funerary Programmes.

The funerary architecture of Persia of the Achemenides conceives three types of monuments.

A first, of which the "Tomb of Cyrus" at Pasargade offers an example, perched a rectangular sepulchral cell in the form of a house, with a low and narrow opening, on the top of a truncated stepped pyramid; it planted this in a rectangular enclosure bordered on three sides by porticos, which were again isolated by a concentric enclosure.(270,1,2).

A second is observed at Persepolis (Nakhs-I.Rustem) as well as at Pasargade, placed the chamber at mid-height of a rectangular tower about 39.4 ft. high and about 23.0 ft. wide; a flight of steps rests against the facade in which the doorway w was pierced. [1]

Note 1. Tower of Pasargade; height 42.3 ft., width 23.3 ft.; floor of the chamber is 16.7 ft. above the ground.

The third formula was applied several times at Persepolis ((Naksh-i-Rustem) and constituted a rock-cut sepulchre excavated in the face of a cliff at about 65.6 ft. above the ground, a grotto divided into a rectangular vestibule parallel to the face of the mountain and a recess, whose floor was hollowed in coffers, more or less numerous; the whole being of modest dimensions. [2] (270,3; 272).

Note 2. At the Tomb of Darius the vestibule measures about 37.8 × 7.4 ft.; each of the alcoveu is about 8.2 × 7.4 ft.

The tomb was externally indicated by a great cruciform tablet cut in the rocky wall. [3] The lower arm was left plain and
399 imitated a preliminary terrace; the upper exhibited a relief representing the sovereign standing on a platform supported by the provinces of his empire, and occupied in adoring the sacred fire, while Ahura-Mazda blessed it; finally the middle horizontal area presents the image of a mounmental facade preceded by a columnar portico, at the middle of which appears the entrance of the sepulchre.(272).

Note 3. At the Tomb of Darius, the cross extends to a height of 74.0 ft. and to a width of 61.2 ft.; the vertical arms are 36.1 ft. wide.

Chapter 3. The Construction.

Persian construction indicates as much power as conscientiosness.

I. The Materials.

Eclectic, it normally and intimately combined bricks, stone and wood.

The facility of execution resulting from building in brick, particularly in a country so unfavorable to transportation as Persia, the faculty given by it for employing a great portion of unskilled workmanship, and finally the example of Mesopotamian art, their master, recommended it to the Persian archite-. cts. In fact, not only at Susa, but also at Persepolis and P Pasargade, the masonry was almost entirely of crude bricks, as proved by the ruins; for the peculiarity characterizing them, of being reduced to elevations of supports, stairways, jambs, columns, and the enclosures of doorways and windows, without the least portion of a wall, indicates that the walls were of the material, so eminently perishable as earth; and this negative evidence is confirmed by positive proof afforded by the vestiges of their locations, recognizable by omissions in the continuity of the pavement, permitting to appear the beds of gravel employed by the Persian builder for his foundations. [1]

Note 1. See pages 402, 403; figs. 271,1; 282).

The bricks were square and measured a foot (1.175 ft.) on e each side, with a height equal to one-fourth or one-half this
400 unit. The burned bricks were much less employed, but still c commonly used for the facing of constructions of earth.

The civil programmes of Persian architecture could only be realized -- as we shall soon state when studying the mode of covering -- by means of a great quantity of beams of long spans, large dimensions, and unusually rigid. What the native soil refused was imported from the distant forests of the Caspian Sea, from Lebanon and Amanus, thanks to the means at the command of all powerful sovereigns, happy to distinguish themselves from their subjects and to manifest their independence of nature. Likewise for stone materials; no more than they h hesitated to bring from afar marble, porphyry, diorite and basalt, was it compelled to adopt the dimensions of the blocks to the conditions of transportation into the mountains. The

retaining walls contain stones 14.8 ft. long and 3.28 ft. high; like the lintels, the jambs are of a single piece; a jamb of the "Palace of Darius" at Persepolis is a monolith 22.3 ft. w high,and shafts measuring 49.2 ft. are composed of no more than three drums! Yet whatever the dimensions,othe cutting was always excellent.

II. The Methods.

Persian construction is commended by the care always taken to ensure a stable site for its edifices. In the embankment
401 enclosed by the stone retaining wall of the terrace beneath e
402 each building, earth was first piled with good care taken to isolate it from the walls by a lining of rubble, and then a l layer of gravel 8.2 to 11.5 ft. thick. Incompressible and still pervious, this ballast presented an excellent support for the walls. For an isolated support the additional precaution was taken to insert between the base of the column and the gravel a large stone slab with the purpose of distributing the pressure over a larger area and of diminishing the risk of displacement. Careful drainage completed these measures.

Like those of Mesopotamia, the Persian architects gave to walls of crude bricks a considerable thickness, [1] and protected them by facings of mortar, stucco, or of burned bricks.

Note 1. Those of the Apadana of Artaxerxes at Susa are 18.4 ft. thick.

Stone construction, which sometimes competed in massiveness with that in earth -- the transverse dimension of the wall supporting the terrace of Persepolis is not less than 13.1 ft. -- did not fail in its care for the jointing. Even when in roughly wrought parts, these were made irregular, it imposed an adjustment so minute, that the jointing is sometimes scarcely d distinct. A careful elevation -- for example, that of the retaining wall of the Palace of Cyrus at Pasargade -- comprises
403 only uniform blocks with beds properly leveled and a correspondance of the joints in alternatiug courses. It was lined with rubble set dry, and this was accurately leveled to the top of each course of stones.(271;4,5).

There was no bonding with mortar, but a consolidation by means of iron cramps in dovetail forms (271,3); the face of the wall was vertical, even when when retaining walls; only in th-

that case their internal face was stepped in order to increase their bearing.

It is a further proof of the conscientiousness and of knowledge in Persian construction, their method of strictly connecting the elements of a structure of mixed stone and earth. I Indeed on the face of the pier or jamb joined to a brick wall, they sometimes arranged a projection to tie the wall, sometimes a slot into which this extended.(271,1).

The openings of doorways and of windows were rectangular and were spanned by lintels.

For the completion of a floor, a pavement was the rule, either in common stone as at Persepolis, or in marble as at Susa.

There should be reckoned among the essential traits of the primary Persian architecture, the extreme boldness of the forms of its isolated supports. Not only did it risk the heights of 65.6 ft., [1] but it again dared to reduce the mean diameter of the shaft to even 1/13 of that dimension, thus realizing a slenderness without a rival in antiquity.(272; 273; 277).

Note 1.

Hall of 100 Columns at Persepolis,	29.4 ft. high,	3.08 diam.
Palace of Cyrus at Pasargade,	29.4	3.34
Propyleion of Xerxes,	54.4	5.12
Apadana of Xerxes,	64.0	5.20
Apadana of Susa,	65.6	5.22

This quality is so much the more characteristic as the intercolumniations were exceptionally great, extended to the point,
404 that those of 28.7 ft. exist. [1] That represents a ratio of void to solid equivalent to between 5 and 6 to 1, while at Karnak the proportion is less than 2 to 1, and in Greece in the c case of the widest spacing, it does not exceed 2 2/3 to 1. It is only just to state, that the comparisons of Egyptian and G Grecian porticos with Persian must take into account the fact, that the entablatures of the former were of stone, while that of the latter was of wood.

Note 1. The intervals between axes measure:--

Hall of 100 Columns	20.3 ft.
Propyleion of Persepolis	27.2
Apadana of Susa	27.6
Apadana of Xerxes	28.7

Indeed this tallness of the supports and their wide spacing

combines with the greatness of the halls to forbid to Persian
architecture the stone ceiling after the Egyptian or Grecian
fashion, as well as the brick vaults in the mode of Mesopotam-
ia. Although no example of the persian covering remains, we
are not only decided on the material,but also on its arrangem -
ent. Ancient texts [2] inform us of what an enormous quantity
of cedar wood entered into the construction of the Achemenide
palace, and the explorers of them have found on the pavements
of those destroyed by fire thick layers of cinders, that cann-
ot be explained without the hypothesis of a covering of carpen-
try. A faithful image of this is offered to us by the facades
of the rock-cut royal tombs, while the exact profile of the e
entablature is revealed by the recesses at the tops of the pi-
407 ers to receive their ends. By means of a series of great ced-
ar beams, so arranged that each layer projected beyond that b
below it, the Persian constructor built up enormous beams and
strong architraves, which supported a framework of timbers co-
vered by planks. For greater safety, the columns were connec-
ted together at right angles to the architraves by beams fixed
on their capitals. [1]

Note 2. Quintus Curtius. History.(V, 7, 5).

Note 1. The mode of covering just explained and the slender-
ness of the columns mentioned indicate the customs and a conc-
eption of the carpenters, who found themselves in opposition
to the natural conditions of a country with so little wood as
Persia proper. But it is proper to recall that before posses-
sing the supremacy in the East, Persia had been subject to Me-
dia, and that it manifested the degree of its dependance by c
considerable borrowings from it. Now the Median country is in
proximity to forested regions, rich in excellent structural w
woods, and indeed according to the testimony of Polybius, the
Palace of Ecbatana contained enormous quantities of cedar and
of cypress, especially employed for the beams of ceilings and
the columns of porticos, so that we may infer,that the Median
construction was substantially in carpentry.

The ordinary mode of roofing was that always preferred by t
the East, and which is still common in modern Persia, that of
the terrace, otherwise appropriate to a cilmate characterized
both by torrid heat and deluging rains. The protecting cover-

covering is a mixture of earth and chopped straw, compacted by
rolling and more than 3.3 ft. thick, supported at the sides by
a parapet composed of a pile of timbers or a brick wall.(274,1).
Still the Tomb of Cyrus at Pasargade and all funerary towers
406 preserved at the same place and near Persepolis show that Per-
sian architecture likewise employed the roof in slopes or bui-
lt in pyramidal form.(270,1; 276,1). The use of tile coverin-
gs is attested by a text of Polybius relating to the Palace of
Ecbatana, and by the discovery at Susa of a system of terra c
cotta plates with upturned edges, 1.70 ft. long and 1.15 ft.
wide, with semicylindrical covering tiles and gutters with
spouts.

Chapter 4. The Effect.

To the merits, that the analysis of its programmes and of i its system of construction have permitted us to attribute to Persian architecture, it is necessary to add that of the possession to an eminent degree, of the sentiment for a really monumental effect and for the conception of some truly superior formulas, some of which constitute the elements of the artistic treasury of mankind.

Perhaps because of an unconscious adaptation of their inventions to the varied nature, to the prodigious fortunes of their race, to the supreme power and the marvellous pomp of their kings; also perhaps since these were masters of Babylon and of Thebes, Persian architects passionately sought for and frequently realized picturesque and impressive arrangements.

On the other hand, they had the taste and the sense of harmony, of proportions and of rhythm.

I. Effects of Affective, Picturesque and Monumental Order.

They loved the effect of material splendor, which moreover was indicated, when it was required to create a ground for the majesty of a "king of kings". The terrace supporting the palaces of Persepolis occupies 1,450,000 sq. ft. (3 1/3 acres), a and the Apadana of Xerxes at the same place and that of Artaxerxes Mnemon at Susa respectively covered about 78,500 and 91,500 sq. ft. But -- an assured mark of a conception truly architectural -- the magnitude formed by them was much less t than that of the voids. Thanks to their method of designing at a great scale the plan as well as the elevation, and especially to spacing at great intervals supports of unusual slenderness, they impressed on these state buildings an admirable character of vastness. Not only halls like that of Susa, that of Xerxes, and that termed the "Hall of 100 Columns" at Persepolis, enclosed areas of about 39,800, 43,000 and 52,700 sq. ft., with capacities of 2,540,000, 2,750,000 and 2,045,000 cubic ft.; but again and in particular, their useful areas, after deducting the sum of the bases of the columns, was not less than 95.5, 95.25 and 96.36 per cent of the total area.! [1](267).

Note 1. Apadana of Susa; total area over all 70,000 sq. ft. Surface in clear in entrance portico 10,107 sq. ft.

Apadana of Xerxes at Persepolis; total area 78,500 sq. ft.

Hall of 100 Columns; total area 71,400 sq. ft.

Another proof of the high quality of Persian architecture is its marked preference for the effects of monumental relief.

It demands a primary one, an example of which is elsewhere offered by Mesopotamia, the elevation of the edifice on a raised terrace. Not only the group of the monuments of Persia is placed on a terrace more than 32.8 ft. high, but the surface of this is again arranged in three terraces of different heights, and each edifice surmounts a separate platform..

This method of associating the picturesque and the ground is again manifested in the arrangement of the stairways permitting access to the terraces. The one by which that of Persepolis is reached is grandly conceived; two divergent flights rise from the ground parallel to the retaining walls as vast stairways, from which two others converge toward a third, to the l level of the terrace; the length of the 111 steps was not less that 23.0 ft. with a rise of 4 inches. Moreover majestic landing was formed by an elongated platform parallel to the faceade and accessible by a flight of steps at each end; that provided on the north front of the third terrace of Persepolis measured no less than 222 ft. long and 16.4 ft. wide.

In the same spirit were treated the facades with double porticos and also the great Propyleion with its two internal and external entrances, each 19.7 ft. deep, 86.0 ft. high and 12.5 ft. wide, and their intermediate vestibule with ceiling on a group of four columns 54.6 ft. high. The proportions of Persepolis were built to impress the visitor by the length of a p passage of 122.3 ft., and by the contrast of its shadow with the brilliant illumination of the spaces preceding and following it.(265; 266,6; 277).

To these different manifestations of a desire to strongly impress the eye and the mind, we may still add that, formed by the royal tombs of Naksh-i-Rustem, at mid-height of a precipice between heaven and earth, in the condition of the deceased, half divine and half human.(272).

II. Effects of Secondary Relief.

The contribution of the effects of secondary relief to the appearance of a Persian edifice seems very unequal, according to whether a wall or a portico is observed, very little in the first case, and quite considerable in the second.

The definition of the mural elevation was satisfactory. High, projecting and accented by the corbelled projections of t the beam plates piled lengthwise on the wall and by the projections of the ends of the transverse beams, the face of the carpentry of the covering forms a plain and frank entablature.(2 (267; 272; 274). An imitation of its relief more or less summarized served to terminate a facade in stone. Thus at the summit of the retaining wall of the terrace of Persepolis, a course projected slightly and was surmounted by a row of dentils, the support of the parapet; thus again, this motive furnished the element developed at the tops of the funerary towers of Pasargade and of Naksh-i-Rustem (276,1), and beneath a cornice profiled in the Greek taste on the Tomb of Cyrus (276,3). As for the crests, they must have had crenelated outlines in the fashion of Mesopotamia, accented by recesses in the faces of the battlements.(276,5,6).

As specimens of the sculptured borders at the sides and below a surface, we find to cite only the bands arranged vertically along the edges of the funerary towers before mentioned ((276,1), and the moulding in ogee form of the base of the Tomb of Cyrus.(276,9).

409 Sometimes Persian architecture, by the refinements of stone-cutting or jointing, sought to break the monotony of surfaces. Thus the front faces of the blocks of the wall, that supports the terrace of the Palace of Cyrus, was chiseled to relieve a boss,(271,5), while inversely those of the stones of the frieze of the retaining wall of the terrace of Persepolis were enhanced by a frame (276,8); so again the surfaces of the funerary towers of Pasargade and of Naksh-i-Rustem are distinguished by the singular peculiarity of a regular arrangement of rectangular recesses and of false openings, these being emphasized by the black color of the basalt, forming their enclosure and ground.

The form of Persian doorways contributed to the relief of t the wall in a certain sense. It comprised indeed an architecture in successive planes with a cap in strong movement. This sometimes presented -- witness the funerary towers mentioned -- the appearance of a lintel raised at its ends (276,2), or again -- as seen on the Tomb of Cyrus at Pasargade -- the con-

confused and ungraceful appearance of a series of mouldings e ending with a slope (276,3); normally, this was a high and projecting cornice, whose hybrid model combined with taste and s success the general profile invented by Egypt, the Ionic chaplet of beads and disks being substituted for the banded torus of the Egyptian type, and finally a triple row of lanceolate leaves, rounded off at the ends and edged with a fillet, which replaced the grooves of the Egyptian cavetto.(276,4; 282).

412 Let us add, that the Persian architect freely resorted to t the sculptor to enhance a surface in relief, as attested oy t the fronts of flights of steps, ramps, retaining walls and the jambs of doorways to be seen at Persepolis.

It is necessary to praise the arrangement of Persian porticos, of which a correct idea may be obtained from the facades imitated on the royal tombs of Naksh-i-Rustem (267; 272). The admiraole width of the incercolumniations, that may be taken at 5 1/2 diameters, [1] was the more impressive from their contrast with the solidity of the high entablatures, whose height almost equaled a fourth of the total elevation. On the other hand, the customary doubling of those broad galleries produced picturesque plays of light and shade, to which responded those caused by the projection of the architraves and the spaced ends of the beams.

Note 1.	Tomb of Darius	4.9 diams.	= 8.6 ft.
	Apadana of Susa	4 2\3	=22.9
	Propyleion of Xerxes	5	= 22.7
	Apadana of Xerxes	5 1\6	= 23.8
	Hall of 100 Columns	5 1\2	= 17.2

III. Effects from Relief of Details.

Nothing better manifests the reality and the tendency of the architectural genius of ancient Persia, than the form imposed on the isolated support. With the fundamental quality of suitability to its function, it associated that of a noble and elegant relief, of a grand character, of an elevated pose enhanced by picturesque details. Certain parts betray a foreign origin; but Persian art interpreted its models with so much freedom and taste, and composed an entirety so original and t tasteful, that its formula is one of the happiest, that men have ever invented.

A primary element of its effect is the slenderness of the s shaft, which we have sufficiently emphasized in our study of construction, and need not return to it.[2] We shall limit ourselves to two remarks; its form is slightly less conical than 411 that of the Ionic shaft, less marked when the capital was simple than when it was compound;[1] its surface might be smooth -- witness the column of the Palace of Cyrus at Pasargade and those represented on the facade of the Tomb of Darius; but most of the time, it was grooved by flutes with sharp edges, whose number varied from 32 to 52; at the lower end of the shaft, this was relieved by an astragal. It had no entasis.

Note 2. See page 403. We may recall that the shafts of the facade of the Tomb of Darius measure 7 1\4 diameters, the shafts of the portico of the Apadana of Xerxes are 10 3\4 diameters; the shaft of the column of the Palace of Cyrus at Pasargade is between 10 and 11 diameteees.

Note 1. Propyleion of Xerxes (compound capital), upper diameter 4.0 ft., lower diameter 5.1 ft.; slope of 0.26 in. per ft.

Apadana of Xerxes, order of the porticos (simple capital), upper diameter 4.5 ft., lower diameter 5.2 ft.; slope of 0.16 in. per ft.

Apadana of Xerxes, order of hall (compound capital), same d diameters as the last; slope of 0.25 in. per ft.

Apadana of Susa, order of porticos (simple capital), upper diameter 4.3 ft., lower diameter 5.2 ft.; slope of 0.20 in. per ft. (Length of shaft restored according to the proportions of the preceding order.

Tomb of Darius, imitated column (simple capital), upper diameter 1.58 ft., lower diameter 1.97 ft.; slope of 0.31 in. per ft.

Persian architecture employed four types of base.

A first one was entirely rudimentary and consisted of a thin disk interposed between the shaft and the ground, of which two specimens are known, one being still in place at Pasargade, a and the other was recognized by Coste at Ecbatana.

A second shows a form dear to Ionia, which is notably illustrated by the order of the Temple of Samos, and may be seen on the portico of the Tomb of Cyrus at Pasargade; a square plinth is covered by a thick cushion, whose convex section is grooved by horizontal flutes (278,1).

412 Grecian art in its Ionic incarnation in Asia is again recalled by the third kind, specimens of which are in the hall of the Apadana of Xerxes at Persepolis, and that of Artaxerxes M-Mnemon at Susa; upper and lower square plinths support a disk, profiled as a plain torus (278,3).

On the other hand, there is no reason for contesting with Persia the invention of the fourth and most original of these forms, which is that of an inverted bell surmounted by two smaller round cushions, the lower being thick and the upper thin, both having incwrved edges. The surface of the bell was decorated by motives elongated vertically -- sometimes simple grooves producing the appearance of the cogs of a pinion (278,4), sometimes of conventionalized water leaves (278,5) or even repeated lotus stems (278,7). In any fashion the form was a happy one, pleasing the eye and satisfying the mind by reason of the broad base arranged for the shaft. Doubtless it was necessary to see in it an ornamentation of the block of wood or of stone employed for the same purpose by the existing peoples of Sinjar and Mazenderan! (280,4,5).

The order of the Apadana of Xerxes at Persepolis and of that at Susa reserved the base with double plinths and torus for t the columns of the hall, which were terminated by compound capitals, while the bell shape was associated with the simple capitals in the porticos (279); the contrary appeared in the Hall of 100 Columns and on the portico of the Tomb of Darius.

413 The part taken by the base in the height of the column is r represented by 7 to 8 per cent of the total height.

Meanwhile the capital forms the most tasteful and most characteristic portion of the relief of the Persian isolated support; it is also remarkable in regard to the effect as to that of structural utility.

Its essential element to which it was frequently reduced, h however careful the programme, was a bracket composed by joining a pair of the foreparts of couching animals -- generally kneeling bulls, but also of monsters. On the support offered by their heads rests the architrave, while on the middle of their common body was inserted the transverse girder carrying the supports of the same aisles. By reason of the increase of surface resulting from its oblong shape, and because of the a

appearance and the reputation for strength of the animal repr-
esented, as well as by the result of the analogy of the archi-
trave to a yoke, this motive singularly favored the purpose a
and the manifestation of the function of support devolved on
this member. At the same time the outline of the folded legs
facilitated the harmonizing of the dominant horizontal of the
bracket with the vertical of the shaft (274; 2/5; 280,1).

Indeed the relief of the Persian column was suited indiffer-
ently to the direct placing of this group on the top of the s
shaft, or to the insertion between the two of a very high ele-
ment -- this is nearly thrice as high as the capital with two
heads, and these together usurp nearly two-fifths of the total
height. [1] Its very compound form places two parts of equal he-
ight on each other; the lower superposes an expanded corolla
above the sort of bell decorated by the forms of pendant leav-
414 es; the upper one consists of a prismatic pier of square plan,
each side being fluted with doubled volutes at top and bottom.
(275; 280,1).

On the whole, a cumbrous but not a confused composition, sk-
ilfully outlined and with the grandest effect.

In the following fashion has been restored the process of t
the invention of the Persian capital. The shape of the mass
of the bulls evidently proceeds from the same principle as the
bracket cap still employed by the peasants of Mazenderan (280,4)
and from the forked one utilized by the Yezidis of Sinjar with
two main branches (280,5).

As for the sculptures of the block in the image of bulls wi-
th joined backs, besides that it accords with the general tas-
te of the ancients and moderns, it recalls the memory of an E
Egyptian idea without actual examples, but of which we possess
415 many representations, that of the heads of lions, gazelles or
serpents, appearing to emerge from a bouquet and to support a
load (280,2,3; 55). The relief of the pier, whose flutes have
the meeit of recalling those of the shaft, presents a singular
analogy to that of pieces of carpentry, and particularly to t
the support of a ridge represented on a rock-cut facade in Ph-
rygia (145,12), while the motive of the volutes, necessarily re-
calls the preferred element of the decorative repertory of We-
stern Asia of the Phoenicians and Hittites. With the bell we

necessarily associate the idea of the palm capital of Egypt ((280,7), and as for the bell with leaves, this arouses in the mind of the historian more than one image of capitals fashioned more or less earlier in Assyria, phoenicia and Ionia (280, 9,10,8); or without speaking of the model offered by nature in the falling branches of the palm tree.

IV. Effects of Harmonic Order.

Certainly Persian architecture was not tainted with regularity. It neither imposed symmetry nor uniformity. At Persepolis, the sides of the terrace were not straight and its surface was not leveled; each new edifice was located without consideration for the positions of the older ones; in the same apadana may be combined two types of bases, and two or even three forms of capitals.

It is no less true, that without mentioning their predilection for rectangular outlines, or more particularly square ones, Persian architects have multiplied manifestations indicative of a very lively taste and a very sure sentiment for effects produced by order and rhythm.

And first it pleased them to place in proportion general as well as particular arrangements, by relating them to one of their elements taken as unit. Thus all dimensions of the Apadana of Susa are multiples or submultiples of a group of seven tiles of the pavement, the same being equivalent to the sum of ten bricks. More characteristic still are the relative constancy of the ratio of the height of the Persian column to the diameter of the shaft and the fact, that half the mead diameter of the isolated supports of the facade of the Tomb of Darius and that of the internal vestibule of the Propyleion Xerxes
416 exactly divides the dimensions of those monuments. [1] (281). T This means that alone in all Asian architecture, Persia applied the modulary system, the generator of the "order", which a appeared to us essential in Grecian art.

Note 1. Facade of the Tomb of Darius.

Height of the base	2 modules.
Height of the shaft	17
Height of the capital	4
Height of the entablature	6
Intercolumniation between axes	12
Width of vertical arms of cross	42

Height of upper arm	28 modules etc.
Propyleion of Persepolis.	
Height of the base	2
Height of the shaft	13
Height of the capital	9
Intercolumniation lengthwise	12
Intercolumniation transversely	7
Width of jambs	6, etc.

The monuments of Achemenide Persia reveal a common practice of proportioning by arithmetical or geometrical methods.

Thus the width of the doorway is to its height as 1 to 1 1/2, 2 or 2 1/2; [2] thus again at the Apadana of Susa the depth of the portico is equivalent to 1/6 the measure of the facade of the edifice; their length is 2/3, like the side of the hall.

Note 2. These proportions are respectively those of the doorways of the funerary Tower of Naksh-i-Rustem, of the Tomb of Darius, and of the Hall of 100 Columns.

Yet an arrangement of the geometrical kind, based on the properties of the equilateral triangle appears to have obtained the favor of Persian architecture; witness for example, the entirety and the details of the facade of the Tomb of Darius and the equally significant composition of the Propyleion of Persepolis. [3] (281).

Note 3. First of the Propyleion.

If on a sketch of their longitudinal elevation be traced a line from one support to the next in the plane of the joint of the shaft and base, and an equilateral triangle be erected on this, two facts are verified. 1. The apex falls on the line of the tops of the columns; 2. The point in which the sides c cut the axis is in its turn the apex of an equilateral triangle, whose base coincides with that of the large one, measures 2\3 its length, and terminates at one end at one jamb, at the other in the axis of the other column (281,1).

If the operation be repeated on the facade of the Tomb of Darius, it is observed that the triangle in question has its apex at the middle of the upper limit of the tablet, at the moral centre of the composition, the head of Ahura-Mazda, and that the axes of the columns coincide with the altitudes of four equilateral triangles constructed on the base of the larger o one and measuring 2\5 of its length.

417 Let us note in closing, that groups of isolated supports, those of the halls like those of the porticos, reveal a marked preference for two numbers, which in the order of frequency of the number of the columns,are 6 and 4, or 7 and 5, if the intercolumniations are counted. [1] Doubtless it is necessary to s see in this fact a result, both of the use by the Persians of two metrical systems, one duodecimal and the other decimal, a and of the sacred character generally attributed by antiquity to the number 7.

Note 1. At the Apadana of Xerxes at Persepolis and that of Artaxerxes at Susa, according to the point of view, the portico presents two rows of 6 columns or 7 intercolumniations; the hall has 6 rows of 6 columns or 7 spaces and 7 aisles. The Hall of 100 columns was pierced by 6 times 6 windows.

On the other hand, at the Tomb of Darius are counted 4 columns or 5 intercolumniations; in the portico of the Palace of the same prince at Persepolis are 2 rows of 4 columns or 5 intercolumniations, and in the hall are 4 rows of 4 columns or 5 spaces and 5 aisles. There were 4 columns in the propyleion of Xerxes and 4 doorways to the Hall of 100 Columns.

V. Effects of Ornamentation.

The evidence of the ruins and of the dazzled Greeks teaches us, that the esteem of the Ancient Persian architecture for b beauties of the monumental, sculptured or harmonic order did not exclude a very strong taste for the charm of ornamentation; indeed the legendary luxury of the kings must have given its tone.

The part of the effect due to the use of choice materials in massive form was secondary, produced by the appearance of the cedar and cypress of the carpentry, of the quite ordinary gray marble of the columns, of the diorite and the basalt of the e enclosures of the doorways and the windows, and of certain bases. On the contrary, much was demanded from the facings, the applied work and overlays, and the paintings.

The walls of crude bricks were concealed by a covering of s stucco, a wainscoting of wood, a facing of bricks carefully made and burned, or one of enameled faience. The last consis-
418 ted of an elevation either -- as the case of the "frieze of archers", that decorated one of the Palaces of Darius at Susa,

and now sheltered in the Louvre -- either of long tiles, 13.8
ins. long and nearly 3.5 ins. high,-- or as shown by the "fri-
eze of lions" preserved in the same museum, and cmoning from
the Apadana of Artaxerxes Mnemon at the same place -- of bloc-
ks about 14.2 ins. long, 10.6 ins. wide and nearly 7.1 ins. h
high; the ground is coarse and friable, but the enamel is sup-
erb, very adherent and brilliant.

Metal played a great part, used in sheets or leaves; thus t
419 the horns and ears of the bulls of the capitals were attached
and gilded parts of bronze; the columns, the beams and wainsc-
oting had plates, sometimes being entirely covered with gold
or silver; finally, gilding in many places enhanced the sculp-
tured portions of the ornamentation.

Persian art had a passion for effects of color. Surfaces in
burned bricks were varied by the use of bricks differently co-
ored by differences in burning. Stucco was tinted; that cover-
ing the walls of the Apadana of Susa was a vivid red in the in-
terior, a gray dove color externally. If we believe Herodotus,
the battlements of the first five walls of Ecbatana were resp-
420 ectively painted white, black, purple, blue and reddish-orange;
those belonging to the wall next the last were silvered, and
those of the final wall were gilded.

Yet the ceramic facings contributed most effectively to the
polychromy; their tone in a dominant blue comprised a strong
blue and a very soft turquoise blue, a deep yellow and a straw
yellow, a hard green and another lighter tint, a purple and a
white, the general tone was warmer in the time of Darius, than
in the epoch of Artaxerxes Mnemon.

From the simplicity of the patterns and the quiet arrangeme-
nt of the harmonies, these panels retained a monumental charac-
ter, while the beauty of the tints, the freedom of the spots,
the brilliancy of the enamel, and the skilfully contrasted com-
position effectively combined in arousing the most vivid impr-
essions of color.

Persian architecture constructed substantially in earth and
in wood, and in but limited proportions utilized the resources
of ornamental sculpture and of statuary. Yet its capitals, b
bases and cornices were carefully wrought; the jambs of the d
doorways were decorated by figures in relief (282); it was the

same for certain parts of the retaining walls and ramps of the
stairways; at the Propyleion of Persepolis the jambs of the g
great portals were cut in representations of human headed bul-
ls 16.4 ft. high and 19.7 ft. long (265); finally the facings
of burned bricks were frequently modeled, and the Persian cer-
amic facings were distinguished from the Mesopolitan by a rep-
resentation in relief of the persons and the motives (283).

The ornamental repertory of Persian architecture betrays the
same eclecticism as the programmes, the structural forms and
the monumental relief; but it manifests therein equally a rem-
arkable power of interpreting a model, of realizing alliances
and combinations producing novel effects, as well as a very r
refined taste, not satisfied by richness without elegance. It
drew from three sources of inspiration accessible to decorati-
ve art.

421 A series of geometrical order comprised the ring, square, c
circle, and equilateral triangle; the stepped merlon, lance h-
head, sawtooth, a row of lozenges, the Assyrian chaplet of di-
sks, rounds and the Ionic egg.(284,3,5,10).

The group of plant motives, essentially composed of elements
of invention in Egypt, Mesopotamia and Phoenicia, combined ve-
ry conventionalized types, several of which were exquisite; s
such were the lotus corolla, open or expanded, often repeated
as if set within each other (284,2), also frequently aligned
and joined by the curve of a common stem, sometimes set at the
top of a stalk more or less high(284,6); palmatiums, daisies
variously represented; lanceolate leaves bordered by fillets,
sometimes erect and sometimes falling (284,7); finally as a g
great favorite and very characteristic of Persian decoration,
an arrangement of two volutes opposed at each end of a vertic-
al line of junction -- in brief, the equivalent of the cushion
of an Ionic capital set on end, or of two shavings raised at
both ends of a board.[1] (284,8; 275). Also note a convention-
422 al image of a tree outlined like a pineapple, doubtless having
a symbolic meaning.

Note 1. See a motive of Phrygian decoration.(145,12).

The part of the animal or human figure was considerable. W
Without speaking of the kneeling bulls at the tops of columns
under the architraves; on the walls were lions walking, seated,

facing and fighting; monsters, winged griffins and hybrids of bulls and unicorns, recall Mesopotamian friezes; from the banks of the Euphrates and the Tigris even came to act as guards at the portals of the Achemenide palaces the cherubim with bodies of winged bulls, completed by a human head crowned by a tiara. [1] (265).

Note 1. See (88; 79; 73).

Finally, the human form appeared; on the one hand, with the appearance of the sovereign fighting the griffin, walking, or enthroned on a platform supported by the provinces of the empire; on the other, as the soldiers of his guard, the great personages of his court, coming to render homage to the sovereign, and tributaries bringing tributes or gifts (282). The placing of these themes on the retaining walls of the terraces beneath the palaces, on the fronts of the flights of steps, on the ramps and walls of the stairways and on the jambs of the doorways, presented the twofold advantage of emphasizing them, and of illustrating the purpose of these architectural elements.

423 Part II. Roman Architecture.

In 753 B. C. begins the period of nearly eleven centuries f filled by the political history of Rome. But the beginnings of Roman architecture cannot be carried earlier than the 3 rd century B. C. Before that date the future capital of the Mediterranean world was merely a colony of Etruria, and with respect to the art of building, open to Hellenic influences.

424 The area of Roman architecture comprises a domain proper and a region of penetration; besides Rome and Italy, the former c comprises Gaul, Great Britain, the Iberian peninsula, north A Africa, the eastern region of the Balkan peninsula; the second combined Greece, Asia Minor, Syria and Arabia Petrea.

Chapter 1. The Requirements. -- Monumental Chronology and Topography.

I. The Requirements.

No civilization other than the Roman at the end of its formation had more need of constant cooperation in the art of building, and none opened to this a wider and more varied career.

For a long time, the exercise of Roman worship depended little on architecture, since the Latin peoples only adored abstractions, political ideas and human actions, forces and natural phenomena. But from consorting with Etruscans, Hellenes a and Orientals, Rome not only adopted the conception of deities personified, actually present in the sanctuaries consecrated to them, but it also annexed to its own pantheon a portion of those of the peoples conquered by it, so much that it ended by becoming a very good patron of religious architecture.

The Romans neglected domestic architecture even less. More than the Greeks, they had a taste for a comfortable and luxurious dwelling; the desired a country house and a city mansion, and a wealth acquired by the pillage and exploitation of some of the richest countries of the ancient world permitted them this satisfaction.

Whether they practised burial or cremation -- the two methods competed in all ages -- they believed in a comparative survival of the dead in the form of shades (manes), and in the n necessity of providing them with tombs, which were voluntarily made monumental.

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Yet these categories of requirements appeared secondary, in

425 comparison with that determined by the Roman conception of the conditions of the national life on the economical, social and political sides.

A primary and important series of requirements resulted from the understanding and knowledge the Romans had of the needs of city life, from their desire to have cities commodious, sanitary and beautiful, provided with good streets, well supplied with pure water, and decorated by monuments.

426 A second followed from the elevated ideas of the Roman amdinistration had of its duties to commerce; it indeed applied itself to supply this with exchanges and markets suited for all business on a large scale; with well equipped harbors, docks, abattoirs, granaries, roads and substantial bridges, that further was a condition necessary to the government, for the policing and defense of an immense empire.

A third was imposed by the necessity of ensuring the action of the political, judicial and administrative institutions of Rome and of the provinces; these required comitias for the meetings of organized bodies, and basilicas for the tribunals.

The dependance of Roman society upon architecture was singularly increased, from the fact that it took under its charge the comfort and pleasure of the people; the custom of bathing daily, contracted in the 3 nd century B.C.; the purpose of gratifying the citizens by walks and by places suited for physical exercises; to amuse them by shows, by scenic dramas, by h horse races, by combats of gladiators, by hunts and fights with ferocious beasts; finally the public exhibition of the artistic booty of the campaigns in Greece and the East, with the preservation of the literary treasures of the same origin, created an enormous need of bathing establishments, public squares, gardens, porticos, palestras, theatres, circuses, amphitheatres, galleries and libraries.

To the immense needs represented by the fulfilment of so many requirements, so varied and frequently very important, was again added for Roman architecture, that of satisfying by the creation of commemorative monuments the desire possessed in t the highest degree by the Romans for perpetuating the memory of individuals and the records of the nation.

The number of the works of public interest was the more con-

considerable, that whether republican or imperial, the Roman state was rich in contributions, booty and tributes; the cities were encouraged in municipal and sumptuary expenses by a p policy of broad provincial decentralization and municipal autonomy; finally, private initiative brought to the government an ardent and generous competition. Indeed it was not rare for even the very onerous cost of a structure at Rome to be provided by a general, returning from a fruitful campaign, and in other cities by a prominent citizen, either led by civic devotion, an ambition for municipal honors, or simply the desire to become noted.

429 After all the causes of architectural requirements just men-
428 tioned, it is proper to mention that resulting from the frequency and the violence of the conflagrations at Rome. [1]

Note 1. Without speaking of the burning of Rome by the Gauls in 390 B. C., note the great fires destroying entire quarters in 208, 52 and 36 B.C., in 27, 65 (under Nero), 80, 191, 237 and 283 A.D.

II. Monumental Chronology and Topography. [2]

Note 2. Italics in the original text distinguish the monuments still in existence.

The last century of the royal epoch (616-510) was occupied by the reigns of Tarquin the Elder, of Servius Tullius and of Tarquin the Proud, and it was marked by several notable undertakings for municipal, military or religious purposes; the creation of bridges and of sewers, the construction of a wall, a and the erection of the Temples of Vesta and of the Capitoline Jupiter. On the contrary and viewed from our standpoint, the two centuries following the expulsion of the kings seem to be vacant. The people were rude, the bulk of the population being composed of peasants, and the aristocracy was avaricious and narrow; besides that every energy was devoted to political struggles and to wars, which were often defensive and uncertain.

1. From the End of the 6 th Century to the Middle of the 2 nd Century B.C.

Toward the end of the 4 th century B.C., the secular wars maintained by Rome for supremacy over the Latins, Etruscans, Sabines, Samnites and Gauls decidedly turned out to her advantage. At the same time the political equality secured by the

plebeians ended the long period of conflicts and troubles. A new era opened for the triumphant and pacified city, thenceforth free to extend its horizon and to increase its ambitions. In 312 the censorship of Appius Claudius, a superior man, inaugurated great public works to illustrate Roman civil engineering by realizing the first road anf the first aqueduct (Via Appia and Aqua Appia). From 303 to 292 were built at least five temples, and finally in 284 the abandonment of the system of roofing with small boards announced a development of the p programmes and of architectural expedients in accord with the progress of luxury, implied by the contemporary substitution of a vessel of silver for one of pottery.

These tendencies were singularly strengthened in the course
429 of the 3 rd century and during the first half of the 2 nd, on the one hand by the submission, completed in 266, of Italy to the Roman power, on the other by the knowledge of Hellenic civilization, which caused from 280 to 168 the wars against Tarentum, against the Carthaginians in Sicily, Philip of Macedon, and Antiochos of Syria in Greece and Asia Minor. The end of the 3 rd century and the first third of the 2 nd were marked by the execution of public works -- the paving of roads, construction of bridges, of useful edifices like docks and basilicas; of a circus; of very numerous temples, even of monuments without any purpose other than to adorn the city. [1] The Sarcophagus of Scipio Barbatus, preserved at the Vatican, manifests the importance of funerary requirements at about the middle of the 3 rd century.

Note 1. Paving of Appian Way (188); construction of Bridge Emilius (184); of the Docks of Emilius (192); Basilicas Portia (184), Fulvia (179), Emilia (176), Sempronia (169); Circus of C. Flaminius (221); Temples of Spes (254), "Vesta"(215), "Fortuna virilis"(214), Vesta (210), Juno Sospita (187), of the Great Mother (192), Venus (184), Pieta (191-181), Juno Queen, (178); Arch of Stertinus (196).

430 2. From the Middle of the 2 nd Century to the End of the Republic (27).

The erection in 147 on the Campus Martius, by the care of Q. Caecilius Metellus, of a marble portico may appear to inaugurate an epoch of architectural requirements in accord with the

rank as a world power to which Rome was promoted the next year by the destruction of Carthage, the reduction of Macedonia to a province, and the establishment of a protectorate over Greece. But progress was opposed by the political convulsions succeeding for more than a century, from the tribunate of Tiberius G Gracchus to the principate of Octavius (133-27). Still, during the last quarter of the 2 nd century, between the revolutionary attempt of Caius Gracchus and the civil war, there were erected an arch, a basilica and a portico, and two temples were rebuilt. [1]

Note 1. Fabian Arch on the sacred way; Basilica Opimia (121); Portico Minucius Vetus (110); Temples of Concord (121) and of Castor and Pollux (117).

The restoration by Sylla of the Temple of Fortune at Preneste (83-78), the undertaking of the Tabularium (Archives) in 78, the construction in 72 of the Temple of Vesta at Tivoli and t that of Hercules at Cori, are the sole manifestations of a notable architectural activity in the course of the half century preceding the establishment of the triumvirate of Pompey, Crassus and Caesar (60).

From 62 to 42, particularly due to the initiative of Caesar, were produced some important edifices; Temple of Minerva on t the Campus Martius (62), Theatre of Pompey, the first one built of stone (55); Forum Julium, Basilica Julia and Basilica Emilia, all three commenced in 54; Amphitheatre of C. Scribonius Curio (46), Temple of Venus Genetrix (45); Curia Julia for the sittings of the senate (44-29); Temple of Saturn, Temple of Divine Julius, and Forum of Augustus (42). After a relaxation corresponding to the struggles ending in the triumph of Octavius -- however noting a restoration of the Regia (36) -- production was resumed in 33 with the construction of a Temple of Julius Caesar, completed in 29, followed in 32 by that of the Portico of Octavius, and in 30 by that of the Amphitheatre of Statilius Taurus.

The enrichment of Roman society by the pillage and exploitation of the conquered countries, its relative affinity to the school of Hellenism, and finally the rivalry of the great families competing in luxury, determined a rapid flight in domestic architecture. From the beginning of the 1 st century rose

mansions with the forms of palaces, such as those of Crassus 431 (died 91) and of Lepidus, which were counted by hundreds fifty years later.

The Tomb of Caecilia Metella, wife of the triumvir Crassus, on the Appian Way -- it dates from the year 60 -- indicates t the development taken by the funerary monument.

3. Imperial Epoch. (27 B.C. to 4 th Century A.D.).

The empire brought numerous needs to Roman architecture. A rare prosperity resulted from peace, order and a rapid circulation of wealth, and permitted ample and constant demands for the public interest as well as for private purposes. Those of the first kind came largely from the Caesars, many of which w were enthusiastic builders, who made the conception and direction of great undertakings their affair, their erection being by their freedmen or by the proper officials.

As for demands of a private character, their number and importance increased in consequence of an extreme development of 432 general wealth, of the formation of immense private fortunes, and finally of an entire permeation of Roman society by Hellenistic and Asian civilizations.

The founder of the empire furnished the example. Thanks to his own undertakings, whose list is long, and also to those a assumed by his best lieutenant Agrippa, and to those he suggested to his friends or favorites, Augustus (27 B.C.- 14 A.D.) could boast of "having left a city built of marble, which he had found built of bricks".

All kinds of architecture were put under contribution for t the restoration of the ancient monuments destroyed, and for t the construction of bridges, sewers and aqueducts (rebuilding in stone the Bridge Sublicius); for the arrangement of squares with galleries (Forum of Augustus or Mars, inaugurated in the year 2 B.C.); of porticos, Portico of Argonauts (26 B.C.), Portico Vipsana (7 A.D.); for the installation of baths, Baths of Agrippa (19 B.C.); for the erection of theatres, Theatre of Balbus, of Marcellus (13 B.C.); for the erection of numerous consecrated temples; to Apollo on the Palatine (28 B.C.), to the ancestral deities of the family of Julius (Pantheon, 27 B. C.), to Neptune in the centre of the Portico of the Argonauts (26 B.C.), to Castor and Pollux (7 B.C.), to Mars Ultor at the

back of the Forum of Augustus, to Concord (10 A.D.), to "Vesta" on the Forum Boarium; for the erection of an imperial Mausoleum on the Campus Martius (27 B.C.) and of commemorative monuments (Arch of Augustus on the Forum (29 B.C.), Altar of Peace (9 B.C.).

At the same time domestic architecture prospered, favored by the prince (House of Augustus on the Palatine), and by the great men.

Equal ardor greatly failed to animate the successors of Augustus belonging to his family. Aside from the important public works (Aqueduct of Claudius, Harbor of Ostia) and a Triumphal Arch in honor of Tiberius (16 A.D.), a Temple under the name of Claudius, commenced in 39 and completed in 69, official demands were almost lacking between the years 14 and 68 A.D.

On the contrary, the demand for palaces (Palace of the Tiber) on the Palatine, Golden House of Nero (65-68) and for mansions (Gardens Lamiani, Maiani, Sallustiani --) was as considerable by the importance of the programmes as by the number of examples.

433 The conflagration imputed to Nero, that ravaged Rome in July, 65, was the more favorable to the interests of architecture, because for a century and a half the holders of imperial power (Flavian, Antonine and Africanus emperors) had in a high degree a taste for building, and several distinguished themselves by a real sentiment for art.

Vespasian protected the artists, is entitled in an inscription the "restorer of temples", rebuilt that of Capitoline Jupiter (74), paid the cost of a Forum and Temple of Peace (75), and commenced the Flavian Amphitheatre, better known under the name of Coliseum, which Titus was to finish (80) and Domitian to perfect (82). The brief reign of the former (79-81) was o only marked by the erection of Baths northeast of the Coliseum, and by that of a Palace.

On the contrary, the principate of the second renewed the g-glorious traditions of that of Augustus. Rome was covered by work-yards, not only with a view of repaining the injuries caused by the great fire of the year 80, but even for the creation of new monuments. In fifteen years were realized superb
434 Temples dedicated to Capitoline Jupiter (82), Vespasian, Janus,

Isis and Serapis, a Forum called Transitorium or of Nerva; a Triumphal Arch in honor of Titus, a magnificent imperial Palace (House Flavian), and a Stadium (Piazza Navona).

In the provinces as at Rome, architecture had equally to praise the epoch of the Antonines.

Trajan required from it, besides an Aqueduct, an interior Port at Ostia and Baths, which he located in the vicinity of those of Titus, a Triumphal Arch on the Appian Way near the Gate of Porta Capena, which was appropriated by Constantine; a magnificent entirety composed of a Forum enclosed by a double portico and accessible by a gateway of honor, a Basilica n named Ulpian, a court between two buildings for archives, placed in its midst being a lofty Triumphal Column.

Hadrian was himself acquainted with the art of building, and attached his name to a reconstruction of the Pantheon (121-124) and of the Temple of Neptune (136); to the erection of a grand and superb Temple of Trajan in the centre of a court with galleries connected with the Forum of his predecessor; to the realization from his own plans of a magnificent Villa at Tivoli (127-134), and of a Temple of Rome and Venus on the Roman Forum (121-135), one of the wonders of Rome in the judgement of Ammianus Marcellinus; to the erection of an enormous Mausoleum (Moles Hadriani) for his burial and those of his successors, which was transformed into a fortress in the middle ages,and bears the name of the Castle of S. Angelo; finally to the construction of a Bridge over the Tiber, the Bridge Aelius, giving access to that monument.(136).

Under Antonine and Marcus Aurelius, the series of imperial demands was continued by those of a Temple consecrated to the divinity of Antonine and Faustina (141), of a Column -- destroyed -- to the glory of the first of these princes, and of three monuments in honor of the second; a Column (after 161), s still standing, a Triumphal Arch and a Temple, both of which have disappeared.

The terrible conflagration of 191 prepared the work for the architects contemporary with Septimus Severus and Caracalla ((193-217). These emperors further did not limit themselves t to restorations and reconstructions. They actively employed themselves in developinm the monumental decoration of Rome.

The Temple and Atrium of Vesta were restored (205-210), and
there were seen to arise an Amphitheatre termed Castrense, a
Triumphal Arch, commemmorating the triumph of the first of th-
435 ese emperors (203), a colossal water Palace termed Septizonium,
an Arch on the Forum Boarium, known under the name of Arch of
the Goldsmiths (204), and finally one of the masterpieces of
Roman art, the Baths of Caracalla (212-216).

Then the demands became scarcer, opposed by a regime of mil-
itary anarchy and by the increasing necessity of defending the
frontiers of the empire. During two-thirds of the century suc-
ceeding the opening of the Baths of Caracalla, monumental Rome
was scarcely enriched by an enclosure of the city walls and a
Temple of the Sun on the Quirinal, both works of Aurelian (270-
275). It was slightly more favored during the following half
century; it owed to Diocletian Baths (306) rivaling those of
Caracalla; to Maxentius a Circus; to that prince and to Const-
antine a Basilica (310-312), which was a marvel of constructi-
on (326); to Constantine alone Baths and a Triumphal Arch (315),
indeed composed of the spoils of another, erected to the memo-
ry of Trajan, and which marked the end of the architectural h
history of Rome.

436 Yet to the requirements o the metropolis during the entire
empire responded a provincial demand, which rivaled it in cer-
tain places and in certain epochs.

For the time corresponding to the principate of Augustus and
of his family, an inventory of the monuments still remaining
would enumerate works of such great artistic value as the Tem-
ple of Minerva at Assizi; Temple of Augustus (Maison Carree)
at Nimes (4 A.D.), Temples of Rome and of Augustus at Pola and
at Ancyra; the edifices of Aosta and of Pompeii; the Arches at
Rimini and Susa; the Arch and Theatre at Orange; the Pont du
Gard or Aqueduct of Nimes etc.

It was in the time of the Antonines, that the prosperity of
the empire attained its climax. The vitality and wealth of t
the provinces were manifested by an admirable flourishing of
monuments in the course of the 2 nd, and in a lesser degree,
during the 3 rd century. Public works and municipal programm-
es, private buildings, theatres, amphitheatres, temples, tombs,
honorary or memorial edifices, were conceived and realized in

abandance, sometimes at a scale and in a style, which would h
have made them worthy to appear in the capital.

To restrict ourselves to some examples, we will cite in Ita-
ly, the Amphitheatres of Capua, of Pozzuoli and of Verona; the
Arch of Trajan at Beneventum (115); in Spain, the monuments of
Merida, the Aqueduct of Segovia, the Bridge of Alcantara over
the Tagus (98-106); in Gaul, the Amphitheatre of Nimes and th-
at of Arles, the Arch and the funerary Monument of S. Remy, t
the Gate of Arroux at Autun; in Great Britain, the Wall of Ha-
drina; at Athens, a "Hadrian's Quarter" announced by a Triump-
137 hal Arch, the Olympeion and a Library; in Asia Minor, numerous
edifices, the Trajaneum at Pergamus, Gate of Hadrian at Adalia
etc.; in central Syria, a magnificent series of streets and t
triumphal squares, bordered by porticor, theatres, baths, tem-
ples, arches, that compose cities like Suweda (103), Bosra (N
(Nova Trajana Bostra) -- (about 150), Atil (151), Kanawat, Mus-
miye (Phaenos), Suleim (Neapolis); another and equally charmi-
ng series is presented in Syria beyond Jordan by Djerach (Ger-
asa), Amman (Philadelphia), Palmyra, Baalbec (Heliopolis); in
Arabia by Petra; finally in Tunisia, the structures of Dougga
(Thugga), of Sbeitla (Sufetula), and of El Djem (Thysdrus), p
possessing an Amphitheatre scarcely inferior in dimensions to
the Coliseum; in Algeria, those of Lambese, Tebessa, Constant-
ine and especially of Timgad (Thaumamadi), etc.

Evidences of constructive activity in the provinces at the
beginning of the 6 th century are; Palace of Diocletian at Sp-
alato (Salone); the edecifes of Treves, then capital of Gaul
and an imperial residence, especially the Basilica, conceived
on the scale of that of Maxentius; the funerary monument of I
Igel; various Ryrian buildings.

Chapter 2. Human, Natural and Technical Conditions. -- Influences. -- Schools. -- Epochs.

I. Human, Natural and Technical Conditions.

The Roman temperament had as characterirtics a rare energy, an intelligenee of mediocre extent, ready to adopt formulas, but clear and methodical; an innate and profound sense of authority and of discipline, a sincere belief in a vast national superiority, and the absolute conviction, that there should be a strict subordination of the individual to the whole, of the worker to the work, and of art itself to the end sought.

Such a disposition is in large measure antiartistic. It forbids in particular the regarding architecture in itself ar a
source of disinterested enjoyment, of expecting from the inter-
vention of persons of genius the creation of novel effects, es-
738 pecially from becoming attached to refinements and to shades,
in brief from aiming at that entire perfection, which was the ideal of the Greeks. On the contrary, it requires one to esteem only the useful and the practical, to have no purpose other than to supply any function of private or public life with the organ most appropriate for its accomplishment, strongest and most durable, to attain this by ways most practical, shortest and most economical.

In fact, the Romans saw in the architect merely an instrument and in his art only a means, just a government machine, when official undertakings were concerned. In that respect, nothing is more significant, than the constant omission of the name of the master from a work, and the no less regular association with this of the name of the magistrate or of the prince, who had charge of its execution.

The realization of the programme, the completion of the structure exhausted the interest taken by the Roman to such a point, that it occurred to him to neglect dressing the exterior! The project comprised an ornamentation, which was separately conceived without any intimate relation to the structural forms, and which was applied on them like a garment on the body, or a mask on the face. Indeed on the one hand, the number and enormous sizes of the works, and on the other, a rapidity characteristic of Roman administrative activity, formed an obstacle to minute care and esthetic refinements.

The practical turn of the Roman mind necessarily allowed a tendency to fix art in recipes. This could only be increased by the methods of execution in public architecture, and which we shall explain later (pages 440-441), and likewise by a very frequent necessity to operate in new countries, badly supplied with trained workmen.

In the number of traits of the Roman character from which a architecture might suffer, it is necessary to count a certain variety of upstart, desirous to exhibit his greatness and wealth; we shall have to take account of this in making a study of the effect.

Finally, let us note that Roman architecture was deprived of the advantage possessed by its Hellenic predecessor, of developing itself in the midst of sympathies and the useful control of a great public; sensitive to art matters and endowed with taste. At Rome the plebeians were rude; frequently half barbarous in Gaul, Spain and Africa. In fact, with the Romans, t the art of building was aristocratic or princely, and in great measure, official.

439-440 If several peculiarities of the Roman temperament were opposed to the development of a brilliant national architecture, on the contrary, others were very favorably conditioned for t the practice of those parts of the art of building, that concern the realization of the programme and the construction.

And first, the Roman monuments give the impression, that their authors participated in the breadth of aim, that clarity of views, that sequence in ideas, that genius in organization, that decision in supervision, which explains the fortune of Rome; that they knew what they desired, matured slowly their projects, and never experimented after the work-yard was opened.

Skilful in foreseeing and in providing, they elaborated a p programme, not by a progressive grouping of parts regarded successively and separately, but by the reflective and united conception of an organic whole, methodically distributed into coordinated and subordinated elements.

Equally removed from stinginess and waste, they spared nothing, that could contribute to the utility of an edifice, to i its stability or its beauty, but they were also on the watch for every economy in material and workmanship.

Their methods were simple, and they were always ready to va-
ry them to suit the conditions and circumstances. They appli-
ed themselves and understood how to make the most of the mate-
rials and to obtain from the artizan the maximum result, than-
ks to a rational division of the work, and to a method of dis-
tinguishing in a structure between a small number of members
wrought by skilled workmen, and merely filling parts, which c
could be executed by laborers.

From its conception to its completion, a Roman architectural
undertaking war subjected to a rigorous material and moral di-
scipline. The work dominated the workman to the point, that
carried out by a Grecian master, it was no less stamped with
a character completely Roman.

Indeed the plans and specifications were prepared with prec-
ision, and the work was carefully superintended during its co-
urse, being verified after its completion by an authority spe-
cially appointed for that purpose. [1]

Note 1. Under the republic, the procedure for an official
undertaking was the following. A decree of the senate assign-
ed its direction to a magistrate, consul, censor, duumvir, etc.;
besides a plan the architect prepared a model, when it only c
concerned a monumental work, and he furnished a descriptive
specification and estimate, which once accepted, became a law
for the execution of the work. The works were done by contra-
ct. The contractors gave real estate as security, and receiv-
ed one half the fixed sum at the opening of the work-yards.
After completion was a strict acceptance. Under the empire,
the conduct of the undertaking was entrusted to a curator, ch-
osen by the emperor or by the magistrate of the city, accordi-
ng to the origin of the requirement.

Private construction was regulated by very precise legislat-
ion, which related to even the details of construction, fixed
the commissions and the responsibilities. Regulations of the
public streets determined the restrictions of alignment, heig-
ht, etc.

471 Likewise the individuality of the artizan was absorbed in t
the lists of working equipment, and the special tradesman in
the unit of the work-yard.

To that coordination of effort, to the arbitrary classifica-

classification of capacities, in brief to that military organization of the architectural undertaking, the Romans owed the power, not only of erecting very rapidly a multitude of monuments, magnificent under the test of a thousand years, but also of as easily building in the most distant provinces as in the capital; in new and scarcely conquered countries as in those of an ancient civilization; on the confines of the Sahara as on the frontier of Germany.

In truth, Roman architecture was liberally supplied with masters, laborerr, eesources and materials. The profession of an architect supported its practitioners, and from the last times of the republic, if not honored, it was at least esteemed equal to that of the physician. A passage of a letter from Traj-
422 an to Pliny the Younger attests at the beginning of the 2 nd century A.D., that there was not a province, "which did not p have men possessing experience and talent". In the succeeding century, Alexander Severus established schools and Constantine followed his example.

Official architecture disposed at pleasure of experienced f free laborers, of professionals subject to requisition, slaves, levies, and finally of legionaries in the provinces. The last were recruited from not only unintelligent laborers, but also from skilful workmen, as attested by citing only a single proof, the creation of Timgad by the 3 rd Legion Augusta, whose general quarters were at Lambese.

On the other hand and guided by their practical sense, the Romans never conceived an enterprise, however considerable, w without a large endowment assured from the beginning.

Now they saw grand things, voluntarily realized the useful beyond the necessary, had a weakness for the colossal, attended to the most modest programmes, to such a point, that posterity could take certain of their markets to have been temples![1]

Note 1. For example, this was the case for the Market for beans and fish at Pozzuoli. The ruins of a rectangular court enclosed by porticos with columns of marble and of granite, w with lateral stalls, a chapel with peristyle at the centre, and a columnar portico before the entrance, were regarded as those of a sanctuary of Serapis. Two rooms provided with stone benches with holes passed for places for the escape of hot vapors. These were latrines!

Their technical means were considerable. Masters of the Mediterranean world, they were benefited by the mechanical inventions of the ancient East and of Greece, as well as the science of Alexander.

We shall not delay to examine the natural conditions found by Roman architecture, since we have previously defined those peculiar to the Eastern part of its area and to the domain of Etruscan civilization. (See pages 154, 159, 256).

With regard to the supply of materials, the situation of Rome was very fortunate; at the site or in its vicinity were easily procured excellent brick clays; a coarse volcanic tufa of greenish gray color (white peperine); a porous and yellowish gray limestone of medium hardness and supporting loads well;
444 (tiburtine travertine); another of reddish color, called stone of Gabies; volcanic sand, the essential element of the famous Roman cement; finally, the Apennines furnished timber. Thanks to the Tiber, which gave access to the sea, it had every facility for placing under contribution Tuscany for its stone of Luna and its timbers of great length; Pozzuoli for its volcanic sand (pozzolana); Gaul, Numidia and Greece for marbles; Syria and Egypt for their hard stones. In Gaul, Spain and Africa was an abundance of good stone, marbles and woods.

The climate of the country in which was exerted the activity of the eastern Roman school was a cause of its progress. It
445 comprised indeed more variety, than that taken into account by the art of building in Greece and the East; less heat, more h humidity, and in certain provinces rigorous cold and snow. [1] It suffices to state that Roman architecture was compelled to an effort at adaptation, to which its Hellenic and oriental r rivals were not forced.

Note 1. At Rome the annual rainfall amounted to even 40 ins. It appears -- we borrow the remark from Lanciani (Remains of Ancient Rome, page 8) -- that ancient Rome had more rigorous winters than modern Rome. At least what induces this belief is the mention made by Denys of Halicarnassos of a tempest of snow, that covered the earth with a layer seven ft. deep, and by Titus Livius of a freezing of the Tiber in 401 B.C. In 271 the Forum was covered by snow for forty days; in 67, a sitting of the senate was adjourned on account of the cold; in an ode

of Horace and a text of Martial are mentions of rigorous winters.

II. Influences. -- Schools. -- Epochs.

One of the most energetil factors of the military and political success of Rome was a thoughtful method of appropriating for itself every quality and every technical superiority recognized among other peoples. This system was applied in the domain of the art of building, as in those of war and of administration. For such reasons Roman architecture appeared as a combination of borrowings and of compromises, like a conclusion of the architectural attempts of the ancient world.

And first from Etruria Rome derived at the same time as its primary civilization, the plans of its houses and of its temples (Tuscan proportions), as well as the essential elements of its construction, the arch and the vault.

Then it exploited Hellenic acquirements, which were revealed to it in the second quarter of the 3 rd century B.C., when it conquered southern Italy and Sicily; it knew these better in the second half of the 2 nd century in the cousse of its campaigns in Greece against Philip of Macedon and in Asia Minor against Antiochus; finally after the reduction of Achaia to a Roman province (146), it was "conquered" by its new subjects. Thenceforth was an invasion of Hellenic architects; when about 146, Q. Caecilius Metellus erected a portico, which inaugurated in the capital luxurious construction in marble, he employed a Greek, Hermodoros, native of Salamine in Cyprus; Greeks likewise were Scauros and Batrachos, the favorite architects
445 of Augustus, and also that of Trajan, Apollodoros of Damascus, the author of his Forum. Indeed, if we credit that prince in writing to Pliny the Younger, it was "proper for architects to come from Greece". And with them came the formula of the Grecian orders, the Hellenic and Hellenistic ornamental repertory, and likewise the theoretical and practical treatises compiled by Latin writers on art, in works of which Vitruvius presents a specimen.

It is doubtless to the Punic architecture of Africa and of Sicily, that the Romans owed their preferred system of construction by concrete of bits of stone and lime mortar. (Page 170).
446 Finally, from the fact that the practice of vaulted construc-

construction in bricks was later than the contact of Rome with the East in Mesopotamia, one may infer that it borrowed from thence this principle.

Yet it is important to carefully specify, that the Romans d dominated their borrowings, and that if they employed foreigners, they subjected them not only to their methods, but also to their own conceptions and tastes. For there was a Roman f fashion, whose reality and characteristics will be manifested in the course of our study.

Indeed it is only just to point out, that the Roman West produced architects of merit; witness Cossutius, who about 175 A. D. was charged by Antiochus Epiphanes with the construction of the Olympeion of Athens; Valerius of Ostia, the author of the Pantheon of Agrippa; Severus and Geler, who labored for Nero; Rabirius, who rebuilt on the account of Domitian the Temple of Capitoline Jupiter; Julius Lacer, who under Trajan built the Bridge of Alcantara, etc.

With the immensity of the Roman empire, the physical diversity of its territories, the variety of its peoples, the antiquity and the vitality of some of these, it was fated to have more than one architectural school. Actually under examination made from our point of view, it reveals a great separation into two areas, one western and the other eastern, on this side and beyond the meridian of the Adriatic, and a subdivision of each into several provinces.

The western region, the only one properly Roman, was the domain of construction in bricks or by a concrete of stones and mortar, with a decoration by a facing. In this is recognized a metropolitan school, to which belonged more particularly Rome and the Roman Campagna, in a lesser degree central and northern Italy; a school of southern Italy and Sicily, strongly permeated by Hellenism; an African school, active from Tunisia to Morocco, which associated with Greco-Roman elements some of Punic origin; finally a Gallo-Roman school characterized by e exemplary construction and by charming qualities of elegance and grace.

The oriental section was only connected to the western by a small number of very loose bands; it was distinguished from t the latter by the constant practice of construction in cut stone, sometimes joined by mortar, and by a realization of the

ornamentation by sculpture of the structural materials.

Greece and Asia Minor remained in the Hellenic path, scarce-
447 ly affected by the Roman conception of civil programmes and by the Roman system of vaulted construction.

Syria formed a separate artistic region, where were introduced on the native ground Hellenistic and oriental elements. It was further divided into several cantons; central Syria or the Hauran, characterized by a construction exclusively of stone and singularly expert, which made of basalt or of limestone -- according to whether it operated in the south or the north of the country -- even the beams, doors and closets, and which understood covering by a dome; Judea, in the time of the Idumean princes and of the Roman administration, when a composite style combined Phoenician forms with Hellenic and Arabic motives; finally, Arabia Petra, that practised a picturesque and capricious architectural style, a hybrid like the preceding. [1]

Note 1. See Volume II, Book I, Part 3, Section 1, and Part 4, Section 1.

From about the middle of the 3 rd century B.C to about the
448 middle of the 3 rd century A.D., Roman architecture was carried on by an evolution, in large measure a sequence to that of Roman society, and it passed through four phases.

During the first, which terminated about the middle of the 1 st century B.C., prevailed an Etrusco-Hellenic style, but w with a truly Roman expression, frank, quiet, with incontestable qualities of character and dignity. The monumental construction was exclusively of stone, almost always in tufa or coarse limestone, masked by a coating of stucco and perfectly dressed. The decoration was moderate, the relief firm and pure. The Sarcophagus of Scipio Barbatus, the Temples of Pieta, of "Fortuna virilis", of Fortune at Preneste, the Tabularium of Rome, and Temple of Vesta at Tivoli, mark this first stage.

In the decline of the republic, the Grecian element under its Hellenistic and Alexandrine forms gained favor, at the uame time that appeared a tendency to force the effect by a development of the relief and the ornamentation; the change is a apparent in an edifice such as the Temple of Hercules at Cori. Under the principate of Augustus, it was accelerated in conse-

consequence of the ability to multiply and refine the sculpture, permitted by the substitution of a construction in marble for that in common stone. Excellent stonecutting, superb entreties and magnificent details recommend this second epoch, r represented by the Portico of Octavia, Theatre of Marcellus, portico of the Pantheon, Temple of Augustus (Maison Carree) at Nimes. The Temple of Castor and Pollux (Temple of "Jupiter Stator"), of Mars Ultor, Forum of Nerva, that of Trajan and the Coliseum.

A third age was contemporary with the epoch of the Antonines and in general with the 2 nd century A.D., and was distinguished by the triumph of construction in burned bricks and in a c combination of concrete, mortar and cut stone, with a profusion of adventitious decoration in costly materials, which betrays oriental influences. The Temples of Rome and Venus, of Antonine and Faustina are evidences of it.

With the 3 rd century commenced a last period. It is marked by the contrast of a serious degeneration of sentiment for effect with a remarkable persistence of the most brilliant constructive faculty; while by simple and economical means were r realized masterpieces of appropriateness and marvels of vastness, richness of materials was preferred to beauty of forms, and a foolish multiplication of oranments produced a confusion in appearance, more strongly characterized because the motives lost their relief and the work became effeminate. The passion

for the colossal is equally characteristic of the art of the time, whose memory is preserved by the Arch of Septimus Severus, Baths of Caracalla, those of Diocletian and his Palace of Spalato, Temples of Palmyra and of Baalbec, Basilica of Maxentius and Constantine, that of Treves, and the Arch of Constantine.

Chapter 3. Programmes and their Realizations.

With regard to realization as to invention, the Roman programmes of the civil order are admirable. Expressing the ambitious energy and the organizing genius, which made the fortune of the ruling people, they possess qualities to be required f from an architectural work; appropriateness for the purpose, practicla simplicity of the economy, clearness of arrangement, and majestic grandeur of scale, when they belong to the monumental category.

I. Public Works. -- Civic Buildings. -- Fortifications.

Nothing better distinguishes and recommends Roman architecture than its skill in public works; in the matter of roads for communications and the supply of water, it not only eclipsed all preceding schools, but again has had no rival during nearly two thousand years. It is true that it had been at a good school as a disciple of Etruscan art.

For the primitive conception of the trail, which its predecessors had never passed beyond, it supstituted that of the equivalent of a street for test by man and storms; this was a c constructed road between two wide terraced ways, a veritable band of solid masonry, whose paving with broken stone or slabs was kept dry by the convexity of its profile. It favored the rapid travel of state couriers, while because of their relative elasticity, the borders were suited to the traveling of men on foot or horseback.

457 Roman bridges do not oppose excessive slopes to passage, and by the spans of their arches, [1] they present no obstacle to n navigation and need not fear freshets, so much the more that the thinning of their piers upsteeam facilitates the flow of the river.

Note 1. These measure 65.6 ft. at the Bridge of Treves, 88.5 ft. at that of Alcantora, 116.0 at the Bridge of S. Martin, b between Aosta and Ivree.

What remains of the Port of Ostia attests that the Romans k knew how to compose a complex and thoughtful entirety of jetties, basins and warehouses.

Yet the triumph of the Roman civil engineering was the water supply of the cities. Nothing was better understood, more practical and more certain than its system, whose quality is me-

measured by certain realiqations still utilized today! At the soucce, frequently distant, was a collecting basin; at the outlet was a structure (dividiculum) with three reservoirs for t the supply; one for public fountains, another for the baths, and the third for private citizens. Between these two ends w was a channel suited to the profile of the ground; here a trench flush with the ground and covered by slaps; there ducts of lead or of terra cotta, underground or following the profile of a valley, and in reversed portions with siphons intended to prevent excess of pressure and to favor the search for injuries; elsewhere a channle supported by a bridge, typical and grand examples of which are presented by the Pont du Gard (322), by the aqueducts of the Roman Campagna, those of Segovia, etc. at certain distances were means for the aeration of the fluid and the cleaning of the channels, and at selected points were filtering basins, vaulted cisterns, sometimes of colossal proportions -- such as the Piscina Mirabilis of Baia, which covers more than 19.376 sq. ft., or again the caverns of Bordj Djedid, which for the service of Carthage stored more than 1.060,000 cu. ft.

An equally just comprehension of the needs, and an understanding of the means of satisfying them characterized the municipal programmes established by Roman architecture. Streets well paved and carefully supplied with sewers, provided with sidewalks and crossing stones with spaces for the passage of horses and wheels of carriages; open squares bordered by porticos; numerous fountains; rapid removal of rain water and sewage; covered markets abundantly furnished with water; numerous and commodious baths; even public latrines with careful drainage of their pavements and removal by water, realized conditions
452 of hygiene, of comfort and of propriety, that the humanity of the 20 th century has not yet succeeded in entirely restoring. (297).

The "Roman peace", which dispensed with fortifying the cities in the interior of the empire, and the military inferiority of the barbarians without siege machines, were the causes that the Romans did not devote themselves to perfecting the art of fortification. Such revealed by the walls of Pompeii, the ruins of Aosta, the enclosing walls of Rome supplied by Aurelian

(299,3), the camp of Troesmis, the Gate Porta Nigra of Treves, -- the system of Roman defense compsised crenelated curtain w walls flanked by square towers, and placed between two very p prominent towers, with polygonal or semicircular plans, were gateways with internal vestibule open to the sky, between an external opening closed by a portcullis and an internal one with folding doors.[1] (299,1.2).

Note 1. At the Gate Porta Pretoria of Aosta, the width of the middle opening measures 27.0 ft.; the depth of the vestibule is 39.5 ft.

II. Domestic Programmes.

The Roman programme of the tenement house was required by t the effort to reduce to the minimum the cost of building. At Rome a slight structure was carried as high from the ground as permitted by the law, even to 70 ft., in danger of falling as much as of fire, and divided into the greatest number of miserable hovels possible, smoked because of the lack of chimnies.
453 For the house of the citizen, Roman architecture successively conceived three types; at first the model was taken from E Etruria; then toward the end of the republic, it imported Grecian elements;[2] finally in the course of the imperial epoch, it became more and more common in the sense of its Hellenistic rival. It always applied the oriental principle of the closed facades and of an arrangement with reference to a small internal court. On the other hand, Roman customs did not require the seclusion of women, and it did not so rigorously separate the domain of public life from that of an intimate existence.

The plan of the Etruscan-Roman house was inscribed within t the outline of a parallelogram or of an approximate figure. (301,1). At the centre was reserved the place for a great rectangular hall, whose significant name of atrium (the black) c came to it from its blackening by the smoke seeking its way to a large opening arranged in the middle of the roof and termed compluvium. A good part of this area was then open to the sky;
454 it was named cavedium (cavern of the house). A basin (impluvium) was also excavated there, which received the rain water shed by the roof and discharged its surplus into a lower cistern (puteus). As for the sheltered area of the atrium, it formed a corridor serving the entire dwelling. The entrance fr-

from the street formed a succession of a vestibule, sometimes projecting but generally recessed, a doorway and a passage (f (fauces) on which opened the lodging of the doorkeeper.

In the middle, on the side opposite the atrium and for its entire width a square area was occupied by a hall termed tablinum, whose front was entirely open and without means of closing except the screen of a curtain. This was the usual room of the master, both his working room, his archives, his hall for the reception of clients, who visited him each morning. His position overlooked the entire dwelling, its size and its wide opening made it perfectly appropriate for these various purposes. At the right and left, it was flanked by a chamber, before which the extension of the rear corridor of the atrium formed small rooms (alas) devoted to the exhibition of the images of the ancestors.

From "wings" to the street was arranged a series of rooms f for use as sleeping rooms, kitchens and servants. An elevation with a second story was frequent, in view of lodgings for slaves and sometimer for rental.

In brief, a clear and practical arrangement, expressive of its purpose and of marked character, which submitted the entire habitation to the patronage of the ancestors as to the eye of the master, and to favor the manifestation and exercise of the social side.

The permeation of Roman civilization by Hellenism complicated the programme of the mansion of the rich by the distinction between a selamlik and a harem (301.2). For the first the Etruscan-Roman arrangement was perfectly suited; it was retained and the second was realized by forming behind a symmetrical w whole termed peristyle (300). This had ar an essential element a court with basin or terrace enclosed by porticos, under which opened closed rooms (oeci) or open ones (exedras), dining rooms for summer and winter, art galleries, libraries and chapels. The peristyle was sometimes doubled, and the luxury of a small garden was added. Communication between the harem and the serail was assured by a passage adjoining the tablinum, and at need by the omission of the movable partition serving as the back of the latter.

This formula was further susceptible of variations suited to

the conditions of the site and the taste of the owner. At first modest, the scale of its examples rapidly increased under the empire, corresponding to the advance of Roman luxury.

The practical economy of the habitation was well understood; awnings shaded the courts; basins, tanks and jets cooled the air at the same time as they pleased the eyes. Drainage and removal of rain water and sewage were ensured by drains connected with the municipal sewers; flues carried off the smoke from the kitchens. Every careful programme comprised a comfortable installation of baths and frequently central heating by a furnace, with circulation of heated air beneath the floors and behind the surfaces of the walls.

At Rome, the imperial palace was merely a development in luxury and dimensions of the private mansion. If as an example be taken that of the Flavians on the Palatine, known under the name of the House of the Flavians, there are distinguished at the first view the amplified equivalents of the atrium and of the peristyle (301,3).

First is a building with facade preceded by a portico; around a central court, enclosed by porticos, follow various rooms; in the middle of the front side is a vast throne hall (aula regia) flanked by a small basilica with a tribune for the exercize of the judicial power of the prince, and a private chapel (lararium); at the rear a symmetrical arrangement has placed a festal hall between winter and summer (nympheum) halls, cooled by a basin .

The harem is distributed around a peristylar court and is d decorated by a great garden within a rectangular enclosure , being terminated at each end by a semicircle and curved into an exedra at the middle of one of the longer sides.

On the whole a logically organized entirety with grand effect.

The ruins of the Palace of Diocletian at Spalato reveal the programme of an imperial palace in the decline of the empire . (301,5). Conditioned both by the oriental tendencies of Roman civilization of that time and by the insecurity of a region n near the threatened frontiers, its programme was that of a fortified capital. The general arrangement repeated that of a R Roman camp, a rectangular area was enclosed by a wall flanked by towers, and divided in four parts by the intersection by

two middle streets. The northern half formed the administrative quarter (barracks, offices and storehouses, arranged around two great courts with porticos. The southern half was div-
457 ided in two parts; on the north two royal courts on both sides of the avenue contained, one the chapel and the other the tomb of the master; to the south extended the palace. A grand circular vestibule gave access to the latter, that comprised the centre reception halls with apartments in the wings and a long gallery facing the sea. Again an arrangement stamped with order and grandeur.

The Romans conceived three types of country habitations. W Without mentioning those termed rustic and pseudo-urban -- the one being the dwelling of the master of a rural cultivation, the other a simple country house skilfully adapted to comfort and pleasure -- the so-called urban villa responded to our idea of a princely chateau. It was frequently a magnificent entirety of luxurious structures, pavilions, porticos, baths, g gymnasiums, shaded alleys and lawns, with living waters, grottos and sometimes -- the Villa of Hadrian at Tivoli offers a typical specimen -- with reductions of celebrated buildings or sites.

458 Let us note that the Romans were extremely attentiwe to orientating their apartments so as to enjoy pleasing views, and according to the seasons and the hours, to lose nothing of the solar radiation, or to protect themselves from it.

III. Programmes of Public Utility.

One of the principal titles of Roman architecture, and one of the most decisive proofs of an admirable sense of organization is the singular quality of the programmes of its edifices of general utility, markets, exchanges and pretoriums, theatres, circuses, amphitheatres and baths.

The place of assembly are for economical, political or judicial purposes, or simply for pleasure, was either an area open to the sky, generally surrounded by porticos, sometimes doubled (forum)(303; 295), a covered hall (portico), or an enclosed hall (basilica).

The market (macellum) as shown by the ruins of Pompeii, Pozzuoli or Timgad, was composed of a court, generally rectangular, bordered by porticos on which opened the stalls; the cent-

centre of the deifice was sometimes occupied by a sanctuary -- it was thus at Pozzuoli -- more frequently by a basin with a
459 fountain. Construction entirely in stone, sometimes of costly kinds, favored cleanliness and sanitation.

The Roman basilica was a very satisfactory solution of the problem of a covered public place. It was sometimes reduced to a single aisle, whose dimensions might indeed be considerable; witness that of Treves, which measured 90 ft. wide with a length of 181 ft. and a height of 102 ft. More frequently rows of columns separated several aisles, the middle one being wider and higher than the side aisles; its greater height made possible its lighting by windows placed in its enclosing walls above the lower aisles. These were sometimes four in number, as the case for the Roman basilicas named Julia, Paulla and Ulpia; more frequently were but two, which were sometimes divided at mid-height by a gallery. The system of multiple naves greatly increased the areas, and since the Roman mode of connecting isolated supports by arches permitted ample intercolumniations, this opposed no obstacle to the necessary spaciousn-
460 ess of the place; the Basilica Julia covered 54,000 sq. ft., the Ulpian more than 43,000, that of Maxentius 48,500, and the middle aisles of the two last mentioned measured more than 82 ft. in width! (304; 303,B;326). Sometimes a return at right angles, of the side aisles across the ends of the plan and perpendicular to the main axis, formed an ambulatory, termed chalcidicum (304,1,2).

At first rectangular, the rear of the Roman basilica, to which was attached a tribunal, was later curved in semicircular form (304,3). The facade was sometimes preceded by a portico. Generally the facades were closed in the ground story; yet the example of the Basilica Julia at Rome attests, that it was admitted that they were sometimer opened by arcades (304,2).

Thus Roman architecture was the first to conceive and to realize a programme both practical and grand, for a place suited for the assemblage of a multitude.

It no less understood how to arrange a hall for a spectacle. Doubtless it profited by the experience of its Grecian predecessor for the theatre and the circus. But it realized too many perfections in importance to be reduced to the condition of

a satellite, and as for the amphitheatre, to its own genius is due the honor of the masterpiece of practical simplicity, that constitutes many of its arrangements.

In general the Roman theatre reproduced that of the Greeks. A stepped semicircle (theatrum) generally terminated at top in a high gallery, and was divided into sectors (cunei) by radiating stairways, and into stories by one or more concentric walks (praecinctiones). It enclosed the area of an orchestra a and was opposite a platform (pulpitum).

Yet the Roman formula was distinguished from the Hellenic by notable differences, resulting from a different conception of the play, or from a better sense of the material conditions a and the convenience of the public. Passing to the stage, this was enlarged at the expense of the orchestra, which was reduced to the area of a semicircle annexed to the hall for the location of places of honor. [1] Another modification -- more important from the standpoint of acoustics, it realized an enormous advance -- consisted in the erection at the rear and sides of the stage, of a high screen of masonry, [1] in the connection of its ends with the wall supporting the semicircle; finally in the installation of a sound reflector over the platform, a and even in the entire covering of the edifice. [2](305;176;177).

Note 1. The stage of the Theatre of Orange measures 201 ft. long and 30.5 ft. wide; that of the Theatre of Pompey at Rome being respectively 328 and 52 ft.

Note 1. At the Theatre of Orange, its height is 118. ft.

Note 2. As an example of a covered theatre may be cited that of Aosta.

The Roman circus (arena) was an area about five times longer than wide, whose division wall extended on its greater axis a and formed a continuous course. It was limited at one end by a semicircle, and at the other or entrance end by an arc of a circle. Along this at the centre was found a triumphal gateway, and at both sides were stalls (carceres), in which the competing chariots awaited the signal for departure; above were arranged boxes for the magistrates and an imperial box at Rome. Along the remainder of its perimeter, the course was overlooked by a series of easily accessible steps, thanks to an ingenious and simple disposition of stairs, of external passages a

and internal galleries. Roman circuses were of colossal proportions. The "Great Circus"(Circus maximus) of Rome measured 2083 ft. in length by 360 ft. and contained 150,000 spectators! The insertion of the middle wall exhibited that faculty of foresight and of practical sense, that recommends Roman architecture. Since it was necessary to facilitate the access of the competitors to the course, and one might rely upon a progressive reduction of the front of their group by the distancing of the inferiors, they conceived the idea of moving the wall to the left at the point of departure, inclining it to the axis of the arena, so that the going course was wider than the returning one, but each being more so at their beginning than end.

The faculty of foreseeing and of providing, of assigning to every function the proper organ, is even better appreciated w when the construction of the Roman amphitheatre is examined in its most complete example, the Coliseum at Rome (290; 307; 302). All is admirable there; the amplitude, the perfect unity, the clearness of the conception of an entirety whose length measures 614 ft., its width 510 ft. and height 159 ft.; the care a and the sense of adaptation of the elements to their role, which is indicated by the choice of an elliptical outline -- in spite of the differences introduced in the execution-- because of the facilities offered by an axial arena for arranging the spectacle; the practical installation of the storerooms, of t the "side scenes", of the necessary machinery in the cellar, excavated in galleries, in cages for keeping the wild beasts, in sewers for rapidly emptying the area, when it had been transformed into a basin for nautical games; the perfect drainage of the edifice; the accurate accommodation of the projections of the stepped seats to the requirements of the visibility of the spectacle; the arrangement in the lower structure of the amphitheatre of galleries for shelter in case of storms; the ingenious arrangement of a movable awning, managed from an external gallery at the top of the edifice, permitted the shading of portions in the same, as well as the refinement of a circulation of water to cool the air, even the distribution of p perfumed air! Particularly should be praised the simple and clear arrangements of the escapes, by which in a few moments

463 with a very orderly service, a crowd of 50,000 persons could be passed out or in ("vomited", to use the picturesque and significant expression of the Romans). [1]

Note 1. The opening of 76 numbered arches in the ground story permitted the division of the multitude of people into as many columns. Each one of these with the barriers opened was fed by the passage of a series of stairways more or less wide from the various concentric passages, which by radial steps e extended to the stepped seats of a sector of the plan.

The programme of the Baths is no less a masterpiece of organization.

464 Complete, a Roman bath successively comprised:-- sweating, or a stay in hot water, reaction in cold water, and anointing the skin; further, it was preceded by gymnastic exercises, sportive games, conversations and literary hearings. This tells the complexity of the arrangement of a bathing establishment, appropriate for so many and such diverse purposes; and how thoughtful and wise such installations must be. On the one hand, the bath service required a dressing room.(apodytium), a warm room (caldarium), a hot room (laconicum), a cooling room (frigidarium), a hall for anointing (unctorium), a warmed room (t (tepidarium), forming a transition between the rooms with extreme temperatures and between the whole and the exterior; finally, a powerful ~~heating~~ furnace (hypocaust), with a practical system for the supply and removal of water. On the other hand, for the exercise and pleasure of the visitors were required o open walks, covered porticos, gymnasiums, exedras, halls, rooms for lectures, and libraries.

Now if there be taken the Baths of Caracalla as the type of this realization, this confirms the mastery with which Roman
465 architecture acquitted itself of the task proposed to it (309). In conformity to its intermediate role, the tepidarium occupied the centre of the structure; equally near the vestibules, accompanied by the vestiaries, the cold hall (308) and the warm hall flanked by the hot rooms. The cells with reserved baths extended before the public baths along a portico, each being provided with an anteroom. The economy in heating was quite remarkable, reduced in expense and perfectly sanitary. The furnaces were placed under the rooms, whose temperature w

was to be elevated, which were ensured against their loss of
heat by an antechamber or a lobby; the gases from the furnace
of the boilers escaped into the air only after having circula-
ted beneath the pavements of the halls, behind the surfaces of
their walls and above the intrados of their vaults.

IV. Religious Programmes.

The Roman conception of the sacred edifice was nothing more
466 than that of the Etruscans, under the empire scarcely competed
with by the Greeks, but without great success.

In imitation of its models, the Roman temple had no other p
purpose than to shelter the statue of the deity reputed to in-
habit it, the ritual equepment and a treasury of precious off-
erings. Thus it was designed at a small scale, substantially
composed of a chamber (cella) and an altar before the entrance.
(310, 11).

The plan generally represented a rectangle, whose major axis
passed through the doorway; but if the site at command did not
permit an extension in depth, Roman architecture did not hesi-
tate to adopt a contrary form [1] like the Temple of Brescia and
that of Concord at Rome (310,10,15). Likewise for the orient-
ation; canonically it should extend from east to west, so that
the sacred image should look toward the sunset; in fact, this
was conditioned on the location.

Note 1. The edifices mentioned have their facades on one of
the longer sides because the location of the first was opposed
by a hill, and that of the second by the existence of the Tab-
ularium.

A programme for a Roman temple did not necessarily comprise
an antechamber equivalent to the Hellenic pronaos; carefully
467 built sanctuaries had none (310,1,5,6,8), like those of Fortu-
na Virilis or of Castor and Pollux at Rome, those of Nimes, of
Vienne, of Cori etc. Further there are examples -- such as t
those presented by the Temple of Jupiter at Pompeii and that
of Esculapius at Spalato (310,2,12) -- of a very elementary r
realization of that element, by means of a scarcely marked pro-
jection of the longitudinal walls of the cell. But a number
of important edifices -- the Roman temples of Concord, Vespas-
ian, Antonine and Faustina, Rome and Venus, etc. -- amply dev-
elop that preliminary portion. (310,10,3).

In general, the cell is lighted only through the doorway; y yet the Temple of Tivoli (312,4), those of Palmyra, and the Roman Pantheon (286) attest that a portion of the light was a admitted by windows; the programme of the Pantheon only provided one, in the form of a large opening at the top of the dome, which dominated from above an interior too vast for the entrance of rain to form an inconvenience. Sometimes and notably in the eastern part of the empire, a semicircular opening was pierced over the doorway.

Like its Etruscan model, the Roman cell was always preceded
408 by a columnar portico, characterized by very great depth and
by restricting the supports to its exterior (310,5-7;280). It was rare -- which is still an indication of Tuscan affiliations -- that it is flanked by porticos along its sides and rear. (310,11). The Temple of Vienne attests the borrowing from Etruscan art of the arrangement with lateral colonnades abutting against two wings extending from the body of the cell at its rear end (310,8,14). As specimens of the Grecian arrangement with a continuous peristyle may be cited the Roman Temples of Castor and Pollux, of Rome and Venus, and those of Baalbec. (310,9,13).

The Roman temple was always elevated on a substructure termed a podium. It was exceptional for this to be in the Grecian mode, connected with the ground by a border of steps; according to Etruscan taste, it was enclosed by vertical surfaces, sometimes pierced by openings, when containing rooms within its mass, as observed in the previously cited Temple of Castor and Pollux. The platform was accessible in front by a flight of steps more or less prominent, with a stairway between side walls, whose width varied from that of the central intercolumniation to that of the entire edifice (310,10,11; 289). It occurred that this was utilized as a tribune -- witness the Temple of Castor and Pollux, that of Jupiter at Pompeii, and the Chapel near the Curia at Timgad (310,12,13).

Most temples were peculiar to a single deity, yet triple sanctuaries were not wanting; they were further required for the worship of the triad of Jupiter, Juno and Minerva, inherited from Etruria. Complication sometimes resulted, as at the Temple of Jupiter at Pompeii, from the arrangement of the rear of

the cell in three chapels (310,14); sometimes, as at Brescia (310,15), from a fundamental division into three distinct aisles, externally announced by the triple doorways, and even by a broken arrangement of the flight of steps with a prominent middle portion; finally, sometimes, as at Subetula (Sbeitla), by the alignment on the same front of three distinct edifices 469 with short intervals, the middle one dominating the others. (310,15). Note again the coupling of two sanctuaries adjoining within the interior of a common peristyle (310,17).

Roman religious architecture loved circular plans, especially when required to lodge Vesta or Hercules. Sometimes this was a columnar pavilion, sometimes a rotunda without peristyle, -- the Pantheon presents a colossal specimen, -- more frequently surrounded by a portico -- witness the Temples of Vesta at Rome and at Tivoli, the Serapeum of Pozzuoli, and the small r round Temple of Baalbec (312).

Sometimes, but the case was more rare, the plan of the Roman temple comprised an enclosure by porticos in the Grecian fashion -- the Temple of Apollo at Pompeii offers an example -- a and even a sumptuous arrangement of the preliminary elements; terraces in stories as at Palestrina, propyleums and external vestibules as at Baalbec.

V. Funerary Programmes.

To the programme of the tenement house corresponded that of the columbarium in the domain of funerary architecture, otherwise termed that of a common tomb, in the form of a great rectangular vaulted hall, in the walls of which were recessed hundreds of niches suited for placing one or more cinerary urns.

For the individual tomb, several types competed.

Sometimes the sepulchre was subterranean, marked by a stele, column, cippus, or by a small structure with the appearance of an altar or a chapel. Rare before the 2 nd century of our era, burial in a sarcophagus finally became more and more common. (329). The imperial epoch preferred the arrangement of a sepulchral chamber in the mass of a monument; the form of the latter was frequently that of a drum placed on a plinth and surmounted by a mound planted with trees, or a depressed frustum of a cone, at whose summit rose a statue of the deceased; such were in colossal proportions the Mausoleums of Augustus and of

Hadrian at Rome (330,3), and again that of Caecilia Metella on the Appian Way; or indeed this was a small structure with complex elevation to be studied at a greater distance.[1] In the
470 2 nd century A. D. commenced the fashion of a tomb in the form of a temple, as examples of which may be cited that of the Flavians on the Quirinal, the Temple of "Deus Rediculus", the Great Tomb of Torre dei Schiavi near Rome, the Mausoleum of Diocletian at Spalato, and the Roman Church of S. Costanza, the transferred Tomb of Constantia, daughter of Constantine. The plans were rather polygonal or circular than square; a chapel intended for the funerary rites surmounted a sepulchral crypt. It is proper to mention separately the rock-cut tombs of Arabia Petra, composed of a bare cavern excavated in the rock and a great front carved in the image of a facade. (335). Finally
471 let us note, that where cremation was the rule, the necessary complement of a family tomb was an ustrinum, i.e., an enclosure intended for the cremation of corpses.

Note 1. Monument of Igel near Treves, that of Julius at S. Remy, that of Dougga, and that of Absalom in the valley of Jehoshaphat. (Pages 496-497; Figs. 330; 313).

VI. Commemmorative Monuments.

The monument commemorating national military events, the imperial glory, the loyalty of a city, consisted of either a trophy, a column, or particularly of a triumphal arch.

The first of these types, illustrated by one of Augustus near Nice, and especially by one of Trajan near Adamklissi, had as the essential element a great cylindrical tower erected on a substructure and surmounted by the frustum of a cone, on the platform of which was placed the actual trophy.

The column, whose height might approach 130 ft.,[1] rose on
472 a prismatic base and terminated in a cap serving as the pedestal for a statue. In the interior of its shaft was a spiral stairway leading to the top, and it had for its surface a carved spiral band (292); it was covered by the beaks of vessels (rostra), when it relacced a naval victory (332).

Note 1. That of Trajan measures 125 ft. without the statue; that of Antonine is 97 ft.

Properly Roman, to the extent that its known applications a appear as symbols of the grandeur of Rome and of the Empire,

the formula of the arch comprises the erection of an oblong m massive structure, at first pierced by a single opening, [2] later by several, exceptionally two but usually three, with an inscription on the facade, and finally crowned by a group of statuary. Sometimes -- witness the Arch of Caracalla at Tebessa -- the ends were treated like the fronts. At first the a arch was actwally a widely opened gateway; then the solid portion always continued to increase, especially towards the top, so that at the beginning of the 3 rd century, the original structure found itself reduced to become the support of a statuary monument and for the exhibition of inscriptions, emblems and representations (331; 314).

Note 2. The width of its opening varies from 9.8 ft. to thrice that dimension.

After these three types of current examples, it is necessary to mention a fourth, the monumental altar, that Roman art borrowed from its Grecian rival. The Ara Pacis (Altar of Peace) consecrated by Augustus at Rome in the year 9 B.C., in commemoration of the reestablishment of peace, consisted of a platform of about 1292 sq. ft., bearing at the centre of a rectangular court enclosed by walls, an altar elevated by a stepped base.

Chapter 4. Construction.

The methods in construction pursued by the Romans are both very indicative of their temperament and exemplary in many respects. They exhibit a clear knowledge of the problems on a c conception always distinct, often grand and bold, of the means for solving them; a very assured acquaintance with the qualities of materials and the play of useful and injurious forces;
473 finally, taste for and the art of simple solutions, practical and economical.

I. The Materials.

Roman architecture required much wood for its current building, into which carpentry entered largely, and for its monumental structures, that sometimes comprised enormous roofs. At Rome, pine was preferred to resist flexure and oak to support a load. Sawing furnished timbers of the largest dimensions.

Clay was long the common material of the walls. In Spain a and Africa, it was directly employed, tamped into wooden moulds. At Rome, it was moulded into squares, that were dried before using.

From the 1 st century B.C., burned bricks were known to the
474 Romans. Not only at the beginning of our era, had they ousted their rival from every undertaking, however unimportant, but again from the 2 nd century and connected with the concrete of spalls and mortar, victoriously competed with stone for the execution of monumental programmes. Manufactured with much care, and according to their purposes, they were variously shaped s squares; rectangles, whose longitudinal section was trapezoidal, when they served as voussoirs; triangles; polygons used f for tile floors; circular sectors, with which were constructed columns, and in plates with projections for facings not adherent (318,6; 320,7,9; 322,1,3). Dimensions were no less variable; from 0.65 to 3.28 ft. for the sides of the squares, and from 0.8 to 3.9 ins. for their thickness. The current type, termed sesquipedal, measured 1 × 1 1/2 ft. (0.97 × 1.48 ft.); another in frequent use, termed bipedal, was square with sides of 2 ft. (1.96 ft.).

The current stone materials at Rome were peperine, travertine, stone from Gabies and the "red stone". Luxurious structures freely employed the crystallized limestones of Luna.

The quarrying processes were those of the Greeks with equivalent results. For ordinary construction was quarried rubble; blocks of medium dimensions for cut stone work, their medium height being about 2 ft., and also colossal monoliths 19.8 ft. long (to be seen in the Amphitheatre of Nimes and that of Arles), even more than 23.0 ft., like those shown by the Amphitheatre of Treves. The cutting of the jointed facing was the object of the greatest care, even when the facade was to be masked by stucco; in the republican epoch and in the 1 st century A.D., it frequently equaled that of the Athenian stonecutters of the time of Pericles. [1] It also comprised the diminution of labor, that the contact surfaces were reduced to a border around a central hollow.

Note 1. For example, see the stonecutting of the Temple of Vesta at Tivoli and of the Amphitheatre at Nimes.

Roman architecture of the imperial epoch made a capricious use of marbles, furnished by the quarries of Greece, Asia and Africa. It loved the white sorts from Greece, the Porium of the region of Olympia, the Pentelicum and Hymettium of Attica, the Thasium of Thasos; the black marbles of Melos and of Laconia, respectively termed Luculleum and Taenarium; the yellow from Africa named Numidianum; the Serpentine from Thessaly; t
475 the veined marbles of Eubea, of Iasos and of Phrygia, designated by the names of Carystium, Iassense, Synnadicum, and oriental alabaster. Roman artisans excelled in sawing thin slabs and in polishing perfectly. They were no less skilful in preparing blocks of granite, basalt and porphyry, equally dear to the Romans, and which they brought from Egypt and Syria.

Yet from the 2 nd century A.D., the favorite material was a concrete of spalls, pebbles or porous and light blocks of lava with lime mortar. The use of this bonding material, whose presence in masonry gives it the name of cemented work (opus caementicum) is to be noted for the first time about 300 B.C. T The Romans prepared it by mixing with one part of lime three of sand, and further when the latter was not from a pit but f from a river or the sea, one-third of pounded tiles; they made a sort of waterproofing by mixing two parts of lime with five of sand. The excellence of "Roman cement" was derived from t the exceptional properties of a volcanic sand (pozzulane), fu

476 furnished by the Roman Campagna, and of which a superior sort was found in the vicinity of Pozzuoli (Puteoli), exported afar in enormous quantities.

Finally, Roman art employed on a grand scale as a coating g gypsum and stucco of marble dust.

Much metal was required; iron for the cramps lavishly used in masonry and for carpentry; lead for fixing cramps and for water pices; especially bronze, not only used for effect (page 510), but also for useful purposes, as for example the execution in this material for the foof of the portico of the Pantheon and of Basilica Ulpia.

We shall complete this enumeration by noting that Roman architecture of the imperial epoch had at command glass of a chemical composition entirely analagous to our own, and of which were made on the one hand, opaline plates (obsidianum), on the other two sorts of glass, one being translucent (translucidum) and the other crystalline (purum), both in dimensions attaining 3.28 ft. at the side.

II. The Procedures.

Roman construction was much superior to that of the Greeks. It is first revealed by its practice in carpentry. While i its rival had known only the elementary system of piling timbers on each other, it sketched out triangular arrangements and organic trusses not resisting the load directly but by extension and tension. This is revealed by the roof of the portico of the Pantheon with its raised tie-beams; the bridge thrown over the Danube by Trajan, an image of which is offered on Trajan's column; the roof of the Constantinian Basilica of S. P Peter at Rome, known by accurate drawings. (317).

The great originality of Roman construction and what did it great honor, is its system of dividing the work by distinguishing between the structure, the parts for strength and the simple enclosures, otherwise termed the framework and the filling. That organic structure, equivalent to that of a body clothed with flesh, offers two advantages; a first one was that of facilitating a rational division of the requirements of executi-
477 on into a higher task reserved for the best workmen, and into a secondary one referred to laborers of less capacities; a second was to permit a premeditated localizing of the stressed

points and a concentration of the means of resistance; in brief, a guarantee of stability and an economy of material and of workmanship. The latter benefit Roman architecture again ensured by reducing to the minimum the amount of material and of effort; for example, preferring two walls spaced apart to a single great wall, a compound pier to a compact mass (page 479), to a continuous tunnel vault a series of arches spaced beneath a light shell (319,1; 324,7).

It succeeded the better, since as a general rule, it was conscientious and attentive to protect itself against risks. That is notably attested by its taste for strengthening by the penetration of the joint surfaces of two adjacent elements, a and still more by the fixing of tenons and metal cramps (320, 1,2,12; 321,5); a proof likewise is the care given to foundations, extending them down to solid ground, and in the lack of a firm natural stratum, by forming an artificial one by means of piles (318,4).

The Wall.

The construction in rubble and that in burned bricks -- certain specimens of the latter are of rare quality [2] -- joined its materials by a layer of lime mortar, varying in thickness from 0.2 to 1.6 ins., increasing in the course of the imperial epoch until it exceeded that of the bricks.

Note 2. See at Rome, the "Temple of the god Rediculus"; the Amphitheatre Castrense; the Basilica at Treves.

In a general way, Roman stone construction (opus quadratum)
478 can bear comparison with that executed by the Greeks, and its best examples -- for example, those shown by the Temple of Vesta, Forum of Augustus, and Amphitheatre of Nimes, are masterpieces of accuracy. At first prevailed the Etruscan mode of t the alternation of courses of stretchers and of headers; about the beginning of our era the suppression of the second arrangement introduced unity in arrangement. Except in the East and in Africa, where was sometimes practised joining with mortar, the materials were set dry, but strongly connected by dowells and cramps in the Grecian fashion, almost always of iron set in lead. In conformity to the principle of economy, the regulator of Roman practice, the materials varied according to the work imposed on them; thus at the Temple of Vesta in Rome, the

supporting nothing are in peperine, a material of medium resistance, while those receiving the weight of the columns are in travertine, which is stronger (318,5).

Construction in concrete rarely formed a wall by moulding i its mixture of spalls and mortar in forms of wood, as for exa-
479 mple, for the substructure of the Roman Temple of Castor and Pollux, which has retained the impressions of the forms and of their posts (318,7). The normal procedure consisted in constructing two facings and in filling the intermediate space with alternate layers of pebbles and of mortar (318,1,2). The facings were executed either in cut stone or in rubble, whose rear ends tapered, or in square bricks, or rather triangular ones. The pointed form ensured penetration of the facings into the nucleus, producing greater cohesion of the elements; this was again increased by placing at regular intervals one or more courses of large bricks (318,1,2) extending through the entire width of the wall; in Africa recourse was freely had to ties by means of vertical and transverse stone beams, equivalent to the wooden framework of half timber construction (318,8). At Rome, they loved to set the stone dies, whose faces measured an average of 3.15 ins. square, not on their sides byt diagonally, so that their grouping presented the appearance of a chessboard of lozenges, and the entirety of their joints, 0.2 to 0.6 in. thick, that of a network (318,1); hence the name of reticulation (opus reticulatum) assigned to the arrangement, and for which was substituted that of opus incertum, when the dies were not regularly cut (318,3). The angles of an elevation of this kind were composed of masonry of stone or of brick. (318,3).

If necessary to fortify a wall, the Roman constructor carefully avoided all waste of material. He preferred a cellular to a solid mass. Thus he enclosed a retaining wall by a series of semicircular niches convex toward the earth (319,2); and again he built a strong wall -- such as that of the Pantheon-- with two concentric facings separated by a wide interval, connected by cross walls and transverse arches (319,1). In a more general way, it may be said, that they always took pains to economically stay a wall exposed to stress by flanking it by another structure (319,4). Better still, it ingeniously conc-

concentrated the resistances against the loads at some points systematically chosen. Instead of making the wall solid, it was composed in one part of piers connected by arches and of another of filling masonry. The arches received the pressures and transferred them to their piers. Their strength was accurately proportioned to their work, it being derived either fr-
480 om the support lent them by a buttress or projection prominent externally, such as shown by the "Temple of Minerva Medica" at Rome (319,3), or the wide bearing of a framework.of arches. Of this elegant and economical solution, the Pantheon presents a typical and admirable example (319,1).

The penetration of dampness into the interior and the variable temperatures of places were obviated by the practical artifice of a layer of air, for which the space was arranged, either by the erection of double walls, or by the application to the internal surface of a silid wall of a paneling of terra c cotta tiles with projections, previously mentioned; behind these their projections produced a vacant space about 2.8 ins. thick (318,6).

As for stairways, the Romans were expert in constructing them of all sorts, visible and secret, with square or circular turns, placed on a vault as well as on a solid mass, built of stone or bricks.

Spanning an Opening.

To cover an opening, the Romans preferred to the monolithic lintel the arch or the straight jointed arch, relieved or not.
481 They carried to perfection the construction of the arch, whose formula was due to their Etruscan masters. It was almost always semicircular; rarely a segment of the circumference; e exceptionally -- a practice of the schools of Cyrenaica and of the East -- with the broken curve of an obtuse pointed arch. The blocks were set dry, as carefully and successfully as their cutting. Precautions were taken against the risks of slipping and of lateral displacement by making the blocks more stable by means of a system of metal cramps and of indenting by tenons and mortises (320,1,2). Sometimes, with a view of facilitating the execution and of reducing the cutting to a minimum, they adopted -- Palmyra presents a typical example -- a compromise between the snstem of voussoirs and that of corbel-

corbelling; the plane of the bed was extended as much as possible and long bent voussoirs were employed, that were kept in place py the weight of their end set horizontally (320,3). An arch was also relieved by the construction of a straight arch above it (320,12).

The arch entirely of cut stone was in competition with a mixed type in which stone voussoirs alternated with those of bricks; with another entirely of the latter material; finally w with another entirely of the latter material; finally with a third, most Roman and original of all, the concrete of stones and mortar with a framework of bricks (320,5,6,8,9).

482 Yet the Romans appear to have had a weakness for the very ingenious system of the straight arch, whose Etruscan origin has been previously noted (page 233), but to which they added important improvements. They risked spans of nearly 16.4 ft., (15.9 ft. at the Theatre of Orange), trusting in the excellence of the stonecutting of the blocks set without mortar; sometimes they strengthened the bonding by projections entering r recesses cut in the joint surfaces themselves, even by the carving of tongues and grooves (320,12; 321,5). Besides, they almost always redmced the bending stress in a lintel or an architrave of the same kind by turning above it an arch to support the upper structure (320,12).

The same precaution was taken when the straight arch was made of bricks, like that to be seen at the Basilica of Maxentius, where the clear span is 5.9 ft.(320,9).

The Portico.

As an isolated, the pier was transferred by Roman construction; it was built of stone or bricks, taking care to proportion its section economically to those of the supporting parts.

It sometimes formed a column of a monolith of hard stone, g granite or porphyry; more frequently of a pile of drums of marble, hard limestone, and even of tufa; it was freely constructed of bricks, or even of concrete connected by a framework of bricks. In the execution of a stone shaft were successfully applied the Hellenic procedures, which we have previously explained (pages 290, 291), including the artifice of reducing t the bed surfaces of two drums to two outer rings. More careful than its rival, it multiplied the joggles of iron set in l

lead; it employed these even in the joint of the base and the stylobate. If the construction of a brick column must be apparent, this was -- witness those of the Temple of the god Rediculus and of the Amphitheatre Castrense -- very skilfully faced with materials of appropriate form (321,3); otherwise this consisted either of masonry filled with concrete, or of a framework of tiles, with intervals filled with concrete (321,1,2).

The crowning of a columnar portico was almost always realiz-
483 ed in the German fashion by means of a monolithic or voussoir architrave, and exceptionally by the aid of an arch.[1] In the East the known spans of stone beams vary from 13.1 ft. to a l little over 16.4 ft.; in the West they were somewhat greater.[2] To lessen the risk of fracture of the architrave, the Romans either cut it in a single course with the frieze, which increased the resistance to flexure, or rather by a happy application of their twofold principle of division of work and of constructing with a skeleton, they relieved the overhanging portion by treating the frieze as a horizontal arch, or in other words, dividing it into blocks with oblique sides set above t the isolated supports, and into intermediate thinner blocks, which were supported by their ends and acted as an arch (321,4).

Note 1. The architecture of Pompeii presents an example.

Note 2.

Temple of Antonine and Faustina.	13.1 ft.
Portico of the Pantheon	16.4
Temple of Mars Ultor	16.4
Temple of Sun at Baalbec	18.0
Great Temple of Baalbec	20.8

When the isolated supports were piers, connecting them by a arches was the rule, and Roman architecture realized this in
484 a masterly way, skilful in treating the junction of two or three arches at the same or different levels (321,6,7,8).

Because of the twofold economy of rough material and of stonecutting taken together, the system of construction in high courses, that we have noted in regard to the architrave, was likewise adopted for the rest of the entablature; thus at the Temple of Antonine and Faustina, two rows of dentils, the facia and the cyma, are detailed in the height of a single block.

The Pavement and the Covering.

The Romans generally formed a pavement by means of tiles.

Toward the middle of the 2 nd century B.C., they borrowed from Hellenistic architecture the syrtem of stone mosaic, that they placed on a bed of plaster extending over a layer of sand, itself laid on the surface of a bed of mortar. They protected themselves from the dampness of the earth and from cold by arranging beneath the tiles a space, that could receive a current of hot air from a furnace.

485— For covering its edifices, Roman architecture had at command several systems, and it is quite remarkable, that if not entirely its invention, they were at least so fully perfected and so perfectly adapted, that they belong to it; indeed they are marked by that spirit of organization, simplicity and wise economy, which characterize and recommend its structural work.

In current practice, it was satisfied by ceilings in carpentry or by light vaults in mortar, strengthened by a lattice work of joists and reeds. The first of these systems was even employed for very wide aisles, as for Basilica Ulpia. In that case the material was sometimes metallic, of bronze and perhaps even of iron (317,1).

The Romans freely covered a narrow aisle by means of stone slabs, sometimes made lighter by recessing coffers in their under side; those still in place at the Amphitheatre of Arles h have a span of 10.6 ft. and a thickness of 1.48 ft.(324,2; 323).

The portico of the Temple of Vesta at the foot of the Palatine presents an example of a ceiling produced by abutting two slabs, one balanced on the wall of the cell, the other on the entablature of the oclonnade (324,1).

Exceptionally in the East and normally in Syria, an oblong space was divided into bays by the aid of arches perpendicular to the greater axis, and over these were set the ends of stone slabs (324,2-4).

Yet all the preferences of the Romans were for covering by vaults, indeed of all possible solutions, this lent itself be-
486 st to the realization of the ideal vastness, revealed by their programmes of public buildings. Their principle was due to t the Etruscans, but they made such developments, that in regard to that part of architecture, the universal history of the art assigns to the Romans a place of honor in company with their rivals, the Byzantines, Persians of the Sassanian Epoch, and

Italian of the Renaissance.

They knew and practised all methods and systems; tunnel, horizontal, cross, cloister, niche and dome vaults; vaults in cut stone or in bricks and vaults in concrete of spalls and mortar. They understood how to combine in the same edifice several types and to realize their mutual junctions. But being practical, they avoided complex combinations and endeavored, without sacrificing any stability, to reduce to the minimum the preliminary works, the use of forms and the difficulties in execution.

As a masonry vault, the semicircular tunnel vault was preferred by the Roman school of the West. It was constructed with care, without connection by mortar, but strengthened by projections and cramps. It was distinguished by the ingenuity and the success of the artifices by which were produced a reduction of the number and the importance of the carpentry serving as centering during the construction. If a series of arches was necessary -- for example for a bridge, care was taken for each to be independent, in order to dispense with constructing as many centerings as there were units, and to be able to erect them successively with a small number of centerings, and if necessary, with a single one (324,8; 322). Better still, this single centering was reduced to the proportions of a narrow a and light arch centering; indeed the Amphitheatres of Nimes a and of Arles inform us, that instead of building a tunnel vault by starting from its springing along its entire length, it was formed by placing independent arches side by side (324,6). A third advance -- yet more remarkable, since it simplified the final construction as much as the preliminary -- resulted from an application to the vault of the very fruitful principle of the division of labor and of construction with a skeleton; as if their role was similar to that of the sides in the thoracic cavity of the body, the arches were spaced apart to serve as supports to a covering of slabs or of concrete; at once was s saved more than half the materials, labor and time (324,4,7).

487 The covering of the Great Temple of Baalbec, whose span of
488 74 ft. attests that the Roman school of the East equally understood how to construct a tunnel vault in cut stone.

In the West from the 1 st century A. D., construction in br

bricks was current, even at a great scale. The covering of an aqueduct at Eleusis shows that the Roman architecture of the East appreciated the procedure, that we have observed in Egypt and Mesopotamia (pages 71, 138), of the construction of a vault in portions. The western school preferred the system by r radiating courses, whose application also comprised the same economy in centering, as when the material was stone. Instead of a continuous centering, arch centres were spaced apart, on which were placed a series of large bricks measuring 1.94 ft. on each side; the whole of these formed the necessary centering.

Roman architecture was not embarrassed in covering by a tunnel vault an annuler aisle or an ascending gallery; in the last case it proceeded by developing a series of tunnel vaults, each springing from a higher level than the preceding one; besides the advantage of simplicity, this solution, an example of which is offered by the "Baths of Diana" at Nimes, further had that of facilitating the lighting (324,5).

An original type was characteristic of Roman construction a and was the horizontal vault, jointed on the principle of the horizontal arch; the ruins of the House of Augustus on the Palatine presents a realization of it, which after the lapse of 20 centuries still spans a space with a length of 11.5 ft. and a width of 7.9 ft.

Roman applications of the system of the cross vault in masonry are rare, at a small scale and confined to the East, to Pergamus and to Djerach. Their structure manifests that practical simplicity, that we have frequently had many occasions to admire; it indeed avoids the complications in cutting and the risks of rupture implied by the bent forms of the intersecting voussoirs, and it prefers the extension of one course into another (207,3).

Likewise for the cloister vault, resulting from the intersection of two tunnel vaults in cut stone without penetration of the jointing; it is only found in Syria and in Asia Minor. T The same for the niche vaults, whose realization in stone is peculiar to the eastern provinces of the empire, for example, notably at Baalbec, Djerach and Spalato. Finally similar for the masonry dome; it is observed in Asia, covering a drum -- witness the little circular Temple at Baalbec -- or surmounting

a square area -- examples of this are not rare in Syria; in t the last case the connection of the circular section of the calotte with the angular plan is obtained by the artifice of corbelling, realized either by placing slabs on the angles, or by constructing a pendentive in the form of a spherical triangle with horizontal courses.

Yet the properly Roman method of realizing these various systems of vaults was the formation of a shell of concrete of spalls and mortar with a framework of bricks. The procedure appeared after the 1(t century A. D.; its use and its fashion d date from the 2 nd century; until the decline of Roman art, it remained in favor and was applied with the hand of a master. It was simple and economical, and with certain precautions was excellent. On a carpentry centering was placed the material in horizontal and not radial layers; it was allowed to set and the centering was removed, and unless an earthquake or human malice interfered, this was ensured to last indefinitely -- witness the Pantheon and the Basilica of Maxentius.

The condition of success was a perfect stability of the concrete; during its construction and the setting, the least movement of the supporting centering caused cracks, and after the completion of the work, any movement of the sppporting walls must produce ruptures with the resulting destriction. Against the second of these dangers Roman architecture protected itself by the expedient of strong abutments -- an external wall, as at the Pantheon, buttresses apparent or masked by the adjacent structures, as at the Basilica of Maxentius (319). The first danger was obviated efficiently by ingenious artifices in execution and by an application of its system of organic construction, divided into the parts of the framework and the filling.

And first, it understood how to dispense with an excessive preliminary carpentry. Instead of massing the concrete directly on the wooden centering, it commenced by forming on the surface of the latter a thin vault of large bricks two ft. square, covered by a second in materials of smaller dimensions, or even of rubble of small sizes, as the custom in Gaul. This shell permitted great economy in scaffolding while ensuring a firm support for the concrete (324,11).

491 A good construction of the latter was again facilitated by the care taken by the Roman constructor to first construct, s starting from the tops of the walls, brick arches converging at the top of the vault, frequently connected at regular distances by rings of the same materials, and also sometimes by arches; so that the wohle formed a skeleton, whose openings were filled with concrete (324,9,10,12). The advantages of the system are evident; an additional guarantee of the stability of the shell during its construction, ability to localize the pressures, and consequently a greater facility in providing the resistance. Generally were constructed open arches with two or three series of bricks connected at regular intervals by g great tiles; there resulted not only an economy of materials, but further a greater stability of the two elements of the vault (324,15,16).

In brief, an application of this procedure on a great scale, a masterpiece of simplicity and of logic, required but a small number of foremen, several masons to construct the facings and
492 the skeleton, a group of carpenters for erecting the centering and the firms, some everseers of the making of the bricks and lime, with an army of laborers to supply the works with materials. By this the Romans realized all the types of covering and in colossal proportions; tunnel vaults measuring more than 78 ft. clear span, such as those over the lateral halls of the Basilica of Maxentius; cross vaults 80 ft. square, like those covering the main aisle of the same edifice; hemispherical domes designed for a diameter of 142 ft., like that of the Pantheon. [1] (286; 308; 325; 326; 328).

Note 1. Let us cite as specimens of cloister vaults the octagonal halls of the House of Augustus on the Palatine, and as an example of niche vaults, the exedras of the Baths of caracalla, whose diameters measure 48 ft.

They further knew how -- for example, as proved by the great rotunda of the Baths of garacalla, the canopy and the Piazza d'Oro of Villa Hadrian -- to arrange the penetration of a concrete vault by secondary ones. They even came to place a dome on a drum pierced as a colonnade (324,8) -- witness the Mausoleum of Constantia (Church of S. Costanza).

The sole problem,for which Roman architecture has not proposed an elegant solution,is that of adjusting a calotte to a st-

structure when not circular. The pendentives exhibited by the edifice termed Minerva Medica and the octagonal hall of the B Baths of caracalla manifest as much uncertainty as inexperience. Yet those constructed of stone and to be seen in the ruins of Djerach do honor to the school of Syria. [2]

Note 2. See in Volume II the pages devoted to the study of Syrian construction.

The system of Roman roof coverings reveals to analysis the smae conception and the same mastery as the other parts of the construction.

If they had vaulted an edifice, the Romans were too sensible to not avoid the superfluity of a roof; they limited themselves to the application to the exterior of the vault of a coating of mortar, on the surface of which were fixed tiles. In t the contrary case, they arranged for these the support of carpentry with two slopes projecting strongly from the walls; this was composed of two trusses, whose construction was before mentioned, and which were sometimes made of bronze. The covering was of terra cotta, fashioned in rectangular and slightly concave tiles with raised edges (tegulae) and joint covers (imbrices), whose form was that of half a frustum of a cone divi-
493 ded along its main axis; these were often set in mortar on their support, and the last of a row exhibited the entire form of an antefixa. The crestings and ridges of the roof frequently projected in form of rolls covered by tiles; the reentrant angles were very practically protected by tiles of appropriate forms in lozenge shape. The rain water was collected by gutters and ejected by spouts.

Monumental architecture sometimes substituted marble for terra cotta, for example, as done for the Temple of the Sun at Rome.

494 Chapter 5. The Effect.

Roman architecture was less successful in seeking for effect than in realizing programmes and in attacking problems of construction.

It exaggerated at first. Doubtless it must be praised for not having neglected these, even when its purpose was of the most modest utilitarian order; to have desired the access to a city, a square or a bridge, should be marked by a triumphal arch; for a market to be monumental; that the humility of public latrines should be relieved by marble seats and mosaic pavements. [1] Yet it lends itself to criticism for having contracted, towards the middle of the 1 st century B.C., a taste for luxury, that a hundred years later became a passion, and from the beginning of the 3 rd century A.D., rose to a frenzy of splendor.

Note 1. For example, see the Arches of Rimini, Timgad etc., the Gate Porta Nigro at Treves; the Bridge of S. Thomas in Provence; the Markets of Pozzuoli and Pompeii, etc.

It may still be reproached for having conceived the factor of effect as not an integral part of the edifice, but as an a addition, independent of the structure; which induced it, when it had adopted concrete construction, to regard relief decora-
495 tion as a species of this facing, and finally to reduce more and more the part of sculpture to the advantage of that of color, even of that of the appearance of precious materials.

Finally, we have to regret, that a school which was a model of ingenuity in the matter of plans and of construction, lacked decorative invention, was devoted to symmetry and kept within the Hellenic rut.

That does not mean that Roman architecture appeared without merit, when viewed in regard to the effect.

It is first necessasy to recognize that of having had its o own taste, a taste for what could impress, astonish and dazzle; more accurately, that for material grandeur, solemn majesty, substantial richness, composite arrangements, brilliant materials and polychrome appearance.

It can no longer be contested, that it very frequently approached its ideal and frequently attained it.

Particularly, it derived honor from the beauty of character

as well as from the number of its productions -- especially i its amphitheatres, basilicas, baths, aqueducts, commemmorative monuments -- retaining a perfect appropriateness for their purposes, a simple and strong structure, or again a colossal magnitude, the more striking that it was made more apparent by t the effort to realize the proportioning of the parts of an edi-
496 fice, not to one of its parts chosen as a module, but to the scale of a man. [1]

Note 1. As examples of colossal programmes, let us cite:-- the porticos of the Roman Field of Mars (Campus Martius), which extended for a length of more than 2.8 miles on an area of 10.8 sq. miles; the Baths of Caracalla, that occupied 34.6 acres, the rotunda of the Pantheon and the vault of the great a aisle of the Basilica of Maxentius, respectively covered 16,200 and 21,600 sq. ft.; the Mausoleum of Hadrian, whose platform measured 276 ft. square, and its drum was 210 ft. in diameter.

I. Effects of Monumental Relief.

Roman architecture conceived the effect of relief in a picturesque key.

Thus it loved circular or polygonal plans, slender elevations, diversified and with movement, notably with orders in stories.

The form of a temple was frequently that of a rotunda. On a rectangular plan, it differend from that of the similar Grecian type by a greater slenderness resulting from a smaller l length, a greater height of the substructure, and to the limitation of this by vertical faces (333,1; 289; 293; 296), and finally to a greater inclination of the sides of the roof.

Likewise for the tomb. In the form of a mausoleum it was set on a square platform, a high drum surmounted by a truncat-
497 ed cone, on the summit of which rose a sculptured portion; [1] (330,3); in that of a chapel over a crypt, it was generally a rotunda and sometimes a polygonal prism (324,13); [2] finally in that of a monument, it was sometimes realized -- according to a formula common in Asia and Africa, from Syria to Morocco-- by a pile of prisms receding behind each other, the last being crowned by a pyramid (330,4); [3] Sometimes -- in the properly Roman fashion -- by the superposition on a substructure, a square prism, a cylinder, and a cone (330,5; 313); [4] the latter

being occasionally replaced by a mass in form of a trumpet or inverted funnel with concave outline (330,1,2).[5]

Note 1. See Mausoleum of Caecilia Metella, and those of Augustus and Hadrian.

Note 2. See the Mausoleum of the Flavians on the Quirinal, numerous tombs in the suburbs of Rome, Mausoleum of Diocletian at Spalato, and that of Constantia at Rome.

Note 3. For example, see the Tomb of Zachariah in the valley of Jehoshaphat and that of Dougga in Tunisia.

Note 4. See the Monument of S. Remy in Provence.

Note 5. See the Tomb of "Absalom" in the valley of Jehoshaphat and that of Igel near Treves.

Likewise again for the commemmorative edifice; when it was not a column or a triumphal arch, the latter then being of one or more arches required one to look upward, and that its summit received statuary (331; 314), it had the form of a mausoleum -- such as the Trophy of Trajan at Adamklissi; or that of a funerary structure in stories -- such as the Trophy of Augustus in Turbie.

498 Finally, let us note as indicative of Roman tastes, the addition of semicircular apses to basilicas and the frequent erection of temples and of markets on a circular or polygonal plan.

The care for impression is equally manifested in the Roman conception of the garden, which in truth in a certain measure found itself restricted by the mediocre resources in plants a and flowers at the disposal of the ancients.[1] It indeed aimed to strike the mind by a reversal of natural appearances and to amuse it by unexpected or complex spectacles. The means were the tracing of straight alleys, the modeling of the ground in terraces, plantings in lines or quincunxes; better still, an architectural or sculptural shape of the vegetation enclosed in lawns with geometrical outlines, surrounded by walls, pierced by openings, curved like vaults, cut into regular forms, even into images of objects; finally the association of architectural and sculptured parts with natural elements (298).

The Romans had at their disposal among plants, the box, laurel, pomegranate, myrtle, cypress, evergreen oak, several species of pines and firs, ivy and acanthus; for flowers, the rose, violet, crocus, narcissus, lily, hyacinth, poppy and amaranth.

II. Effects of Secondary Monumental Relief.

The secondary mounmental relief of Roman edifices announces, as much as their entire shape, the desire to strike the eyes; for the examples abound in outlines and in broken facades, even to excess. Such were the broken facades common in Syria, Arabia Petra, Africa and also at Rome, in the decline of the of the empire (335); such were the porticos with flights of s steps, indented in bastions by the penetration of stairways i into intercolumniations (333,2); such were the lanterns with colonnades dear to funerary and commemmorative architecture; (313; 335); such the false porticos realized either by the erection before a wall of columns attached to it by the entablature (295), or more simply an arrangement of pilasters or eng-
499 aged columns set before a pier or a wall to receive the springings of a cross vault; [2] and also the niches recessed in external or internal facades (286; 291); the projections of the profile of the substructure (289; 293), the deep coffers recessed in the ceilings and vaults (286; 351).

Note 1. See Theatre of Marcellus, Coliseum, and the walls of numerous cells.(333,5; 289; 307).

Note 2. See Triumphal Arch of Constantine, Baths of Caracalla (326), of Diocletian and Basilica of Maxentius.

The enclosures of the openings of doorways and windows contributed much to the animation of the walls; if rectangular, t they were frequently profiled with projections somedtmes decorated by ears, frequently enhanced by a cornice, supported or not by consoles (324). When instead of a lantil was an arch, Roman art had the good taste to derive an effect from the manifestation of its structural role; or indeed it limited itself to exhibiting the structure of its masonry by accenting the j joints and by marking the springing by the projection of an i impost; or rather it made this project beyond the plane of the wall by the artifice of an archivolt with projecting profile; finally it distinguished the keystone by assigning to it dimensions and relief exceeding those given to the remainder of the voussoirs (308; 314; 327).

500 III. Effect by Relief of Details. -- The Orders.

Without speaking of the pier, usually erected on a rectangular plan, Roman architecture disposed of no less than six ord-

orders; the three Hellenic on the one hand, on the other being
one called Tuscan, derived from an Etruscan origin, one compo-
sed of the Ionic and the Corinthian and termed Composite, who-
se vogue commenced in the 3 rd century, and finally an invent-
ion of capricious character, contemporary with the decline of
the empire. In fact it disdained the Doric, whose severity d
did not correspond to its dieal of richness; it made little u
use of the Ionic, whose elegance accorded badly with the pomp
of its arrangements; on the contrary, it freely used the Tusc-
an, loved the Composite, and was passionately fond of the Cor-
inthian.

501 As for the Grecian types, it was induced by its passion for
effect to force their expression in relief by a modeling more
contrasted and complex, and to strengthen them by the combina-
tion of elements borrowed from two of them; thus by placing a
Doric entablature on a Corinthian colonnade. On the other ha-
nd, the care for economy of time and work inclined the Romans
to prefer to the onerous refinement of curves intended to ple-
ase the eye, the practical simplicity of those produced by a
turn of the compasses.

When an arch was supported by columns, these received the i
imposts, not directly on their capitals, but by the intermedi-
ate portion of an entablature (336;2; 343). Only in the extr-
eme decline of the empire became customary a system of direct
connection of the two elements, whose exceptional use is attes-
ted by the ruins of Pompeii before the year 79 A.D.(336,3).

502 Among the characteristics of the schools of Syria and of As-
ia Minor is counted a singular method of raising in the form
of an arch the architrave of the middle intercolumniation of
a facade portico (337,1); the Triumphal Arch of Orange exhibi-
ts a happier realization of the idea, resulting from a differ-
entiation of the two elements.(337,2).

With exceptions -- there may be cited those shown by the Tem-
ple of Fortuna Virilis and the Theatre of Marcellur -- most Ro-
man examples of the Ionic capital represent counterfeits mech-
anically executed. In the decline of the empire, they someti-
mes pleased themselves by heads projecting from the eyes of v
volutes. [1] The entablature was distinguished from its Grecian
prototype only by a reduction of the height of the frieze.
Lovers of symmetry, the Romans did not give the caps of the a

antes any special form, but imposed on them that of the capital.

Note 1. See the ancient capitals used again in the church of S. Maria in Trastevere.

Tuscan Order.

Almost always, the Tuscan column was provided with a base,
503 whose form varied from that of a simple enlargement of the shaft to that of the most detailed of Ionic bases (338;7,9).

The shaft, whose height increased as the career of Roman architecture developed, [1] was slightly conical, frequently smooth, otherwise grooved by 20 to 24 flutes, that were sometimes filled by cables for the lower third of their height.

Note 1. At first equivalent to 7 diameters, finally equal to more than 12.

The canonical capital consisted of a square plate, joined to the shaf by an intermediate moulded cushion, either with the practical profile of a quadrant, or according to the wavy cyma. But they loved to enrich the outline by cutting a hollow and making the mouldings more complex (338,1-4).

The Tuscan entablature recalled the grand lines of that of
504 the Doric order, but modified the proportions and the character. On the whole, it was lower than its model, the reduction affecting the frieze less than the cornice and the architrave. At first these exhibited a plain face -- an example is presented by the Theatre of Marcellus; but under the empire its surface was broken by the projections of bands stepped in Ionic fashion. Less refined and more practical than its Hellenic p predecessor, Roman art did not embarras itself by an elegant solution of the problem set at the end of a Doric frieze (page 345); it permits this to terminate in a fractional metope, doubtless for the season, that the reduction of the last intercolumniation required by the Grecian system with an angle triglyph, introduced a complex requirement and a lack of symmetry, equally repugnant to its taste. On the other hand, because t this produced an effect, it voluntarily took the trouble to g give the triglyphs a strong projection beyond the surface of the architrave (338,6). As for the cornice, excepting in regard to the ratio of relative height, it was sometimes conformed to the Grecian type, sometimes differentiated from it by t the addition of dentils, or by the suppression of mutules; fi-

first simple and firm, its profile became more and more detailed after the decline of the republic.

505 Corinthian Order.

Roman interpretations of the Corinthian order are distinguished from those realized by the Greeks by peculiarities, that all aid in the enrichment of appearance. Those contemporary with the 1 st century B.C. are admirable, -- for example those presented by the Temple of Vesta at Tivoli (340), the portico of the Pantheon, the Maison Carree at Nimes, and the Temple of Mars Ultor (341); several are entirely worthy of attention, -- such as those revealed by the remains of the Templesof Vespasian, of Venus and Rome, of Antonine and Faustina, and of the Sun (348); but also the conception does not fail to be in bad taste and the execution is mechanical.

The ratio of the height of the column to its diameter was ordinarily 9 1/2 or 10 to 1.

The base was of the Attic type, placed on a square plinth a and quite frequently decorated by additional mouldings (348).
506 Sometimes, -- and frequently when it belonged to an ornamental column, set beforea wall -- it stood on a pedestal, whose height might equal one-third of the total height, and which formed a powerful factor in the picturesque effect,of which the Romans were so fond (327). [1]

Note 1. Notably on the triumphal arches.

Slightly conical, sometimes with and sometimes without entasis, unless its material was of hard stone, the shaft was channeled by 24 flutes, the lower parts of which were sometimes r raised by rounds. There also occurred a development of grooves in spiral form with symmetrical scholls of historical bands, inserted in a recess enhanced by reliefs or even by the imitation of the trung of a tree. In Syria, a console projecting at mid-height doubtless served as a support for a statue.(333,3).

Sometimes -- **witness** the order of the Baths of Agrippa (315) and that of the upper story of the Coliseum -- the capital recalled the simple type with lanceolate leaves, of which an example is offered by the Theatre of Dionysos at Athens (page 3
507 364; Fig. 247,1); but as a general rule, it was fashioned according to the finished formula of the acanthus bell. At first equal on the average to the mean diameter of the shaft, its h

height increased by one-third -- by reason of an endeavor to
make the second row of leaves equal to the first. After havi-
ng been carved in the image of the curly acanthur, the foliage
assumed the more toothed and dryer appearance of that of the
olive. Under the republic, the space between the volutes was
furnished with a large wild rose flower in the Etruscan tarte,
a typical example of which is presented by the order of Tivoli
(340); later this motive passed to the section of the abacus
while losing its dimensions. Sometimes it was replaced by the
figure of an eagle, by a person or a trophy; they likewise lo-
ved to substitute for the volutes rams, winged horses, griffi-
ns or dolphins, whose outlines were similar to those of the f
former (342; 348).[1] There are examples -- the Arch of August-
us at Aosta furnishes one -- of capitals contracted above the
538 row of acanthus leaves, as if it had been desired to create t
the appearance of two bouquets, the upper emerging from the l
lower one.

Note 1. See the pilasters of the Temple of Mars Ultor and the capitals of the Temple of Concord.

For the capital of the ante, the Roman Corinthian comprised no form other than that of a flattened capital.

The Romans did not object -- witness passages of Vitruvius and the Arch of Augustus at Aosta, to cite a single example-- to crown a Corinthian colonnade by a Doric entablature; but t the rule was to employ the Ionic in treating it for effect. To render the profile more impressive, to multiply and diversify the reflections of the light and strengthen the shadow, the s surfaces were inclined backward, the soffits were made more or less inclined, and the frieze was profiled in a convex or wavy line, the cornice was extended in height, even to become equal to the sum of the architrave and the frieze, and it overhung so much, that it was necessary both to lighten it by recessing coffers, and to support it by corbelling out medillions or consoles set over dentils or even projecting from the frieze.[1]

Note 1. Thus at the Coliseum.

Composite Order. -- Fanciful Orders.

The Composite order, characteristic specimens of which are presented by the Baths of Caracalla and of Diocletian, differed from the Corinthian only in the form of the capital. That

resulted from the development of the Ionic type with ornamented necking, of which the Erechtheion offers a splendid example (244), or if it be preferred, of a perfected and sumptuous application of the elementary formula of the bracket set on a b bell, which we have mentioned in our study of the origin of t the Ionic order.(Pages 356-366,367). A normal capital with h heavy diagonal volutes surmounted a bell, whose lower portion was marked by two rows of acanthus leaves, and the upper zone was enriched by foliage, flowers, figures, and by various motives (343; 346).

As an example of hybrids, we may further cite a carved capital at Kanawat in Syria or a Tuscan capital appearing to emerge from an acanthus bell, and a Roman capital, where above a band of the same foliage, four victories appear to support the
509 angles of the abacus, while between them project trophies and arms (346).

Note also that the productions of the schools of Syria and of Africa indicate a weakness for hybrid arrangements, [1], and that the Egyptian cornice was the type of the crowning in favor south of the Mediterranean, from the desert of Syria to the straits of Gibraltar.

Note 1. See the elevation of the Tomb of Absalom, that superposes on an engaged Ionic colonnade an architrave and a Doric frieze.

IV. Effects of Ornamentation.

Of all effects permitted to the art of building, that of ornamentation was most appreciated by the Romans; likewise they adored it.

And first they were lavish with those resulting from choice materials carefully decorated; it may be said, that they had a passion for everything that shines.

Thus it was the rule that a wall should at least be coated with stucco. The operation was conducted with as much skill as conscientiousness, and it comprised the application of three to six layers, first of mortar more or less fine, then of a paste of lime and marble dust, with a perfect polishing of the
510 latter. If the surface were concrete, its roughnesses were expected to retain this coating; if they were of stone or brick, adhesion was favored by driving in nails or by cementing thin bits of marble in the supporting wall.

No less attention was paid to the execution of marble facin-
gs, that the Romans greatly loved, and whose use on a great s-
scale is one of the characteristics of their architecture. T
The slabs were held to the wall by a layer of cement and reta-
ined by metal champs and anchors (322,2).

The vaults were covered with stucco, sometimes with mosaics
of marble or of glass.

As for the floor, it was sometimes composed of a very smooth
layer of stucco, more frequently of a marquetry of small cubes
of marble set on a bed of mortar, supported by a layer of con-
crete, itself superposed on a bed of ballast; after the work
was completed, the crevices were filled by covering the surfa-
ce with a cream of mortar of marble, and finished by careful
polishing (347).

Such as we have defined it, Roman taste must be satisfied by
the gleam of metal; indeed platings of bronze were freely made;
thresholds; tiles as at the Temple of Vesta at Rome; doors li-
ke thoseo of the Pantheon are still in place (334); capitals --
there may be again cited as examples, those of the edifice be-
fore mentioned, and also those at Djerach and at Palmyra, whi-
ch were economically composed of a stone nucleus and a metal
covering. Applications of gold were equally in favor.

51 Finally, when the client could afford the cost, domestic ar-
chitecture of the imperial epoch employed ivory and even prec-
ious stones!

As much as to the reflections from polished materials, the
Romans were sensitive to the attractions of color, and yet mo-
re to the prestige of a varied polychromy.

They tinted their stucco coatings, either by spreading the
coloring matter over their surfaces while still fresh -- that
was the usual procedure, when it was only necessary to apply
a lime wash -- or by placing on the dry coating an adhesive
liquid charged with pigments, or rather by covering the surfa-
ce with melted and colored wax, that the reat of a brazier fin-
ally incorporated with the surface of the wall. Guided by a
very correct sentiment for the effect, they sought for warm t
tones, frank tints and contrasted harmonies; their palette was
charged with white, black, reddish brown, ochre, blue, green,
yellow and red.

They enjoyed elsewhere an amateur's polychrome mosaics, and they understood how to derive a color tone from visible construction in bricks, either by setting yellowish tiles with red
572 mortar -- the "Temple of the god Rediculus" offers a typical and successful example -- or they contrasted light yellow bricks with others of a warm red shade.

Yet to the splendor-loving eyes of the Romans of the empire, no polychromy equaled that of white marble and hard stone as the elements. Indeed they disposed of an extended scale of b brilliant tints; frank tones like the red of the marble termed "antique red" and of certain sorts of porphyry and granite; t the green of serpentines (antique green), or certain basalts, porphyrys and granites; the black of basalt and of "taenarium" marble (antique black); complex tones like the orange-yellow of the marble of Numidia, or the medley of red, brown and green of the marble of Iasos. And the magnificent effect of these various materials was again multiplied by the composition of variegated harmonies by means of marquetries skilfully pat-
573 terned, and by the variegation of columns, for example, whose
574 bases were of white marble, the shafts of colored marble, of granite or porphyry, and the capital of white marble or even of metal!

V. Effects of Decroation.

Roman architecture used and abused effects of ornamentation. It demanded from it refinements of masonry jointing; such as that reticulated arrangement previously mentioned; that recessed jointing actually executed or imitated by sinking in a coating of stucco (349;393); again the happy solution proposed for the problem of combining the joints of voussoirs with the beds of the adjacent courses.

It particularly loved to compose with clay tiles geometrical figures, and still more -- in the Alexandrine fashion -- with the elements of mosaic or marquetry of marble, drawings and p paintings, many of which are masterpieces of taste and execution; sometimes these were thin blocks of varied colors, employed as a painter does touches of color -- in this case the work was called "opus tesselatum" or "vermiculatum"; sometimes the work then took the name of "opus sectile"-- the material was cut according to the outlines of the motives to be represented. (347).

Roman architecture was prodigal with ornamentation in relief, even to overloading, confusion and unsuitability.

It ingeniously complicated the outlines and multiplied the pretexts for goldsmith's work in stone. Jambs, arches and mouldings were frequently covered by sculptures (348). The entablature was especially ornamented, its projections wrought, its horizontal arches being decorated by motives of scholls ((311; 339). The severity of the Tuscan order was corrected by luxurious ornamentation; beads on the mouldings, leaves in the hollows, eggs on the echinus, rosettes in the panels of the l lower surface of the abacus; pateras, rosettes and ox-skulls on the metopes of the frieze; frets on the edge of the facia etc. [1] (338,4; 339). They came to pretty things like the drops carved in the time of the Flavians in the spaces between t the dentils. [2] The profusionwas greater when very frequently
515 the motive resulted from the modeling of a coating of stucco or plaster, and even if the work of the sculptor, the execution was in the greatest measure mechanical. In these conditioons, the work of the Roman ornamentists risked being, and frequently was tainted with coldness and dryness. Yet the art of the republican epoch understood how to create profiles of admirable firmness -- such as those of the Temple of Vesta (296), and that of the imperial period produced exquisite decorations of friezes and panels, in the first rank of which are counted the specimens offered by the ruins of the Ara Pacis of Augustus and of the monuments of the south of France (315; 344; 345).

Note 1. See the remains of a column and entablature found at Rome in the ruins of the Regia.

Note 2. For example, see the Temple of Vespasian (339).

516 The school of Syria is distinguished by a special style, characterized by a weak and uniform relief of the sculptures, an execution firm and rather dry, an appearance of cutting analagous to that of work in metal, all peculiarities which will a appear to us as distinctive of Byzantine decoration. (Vol. II).

The repertory of ornamental Roman sculpture comprised on the one hand, an abundance of geometrical elements or very conventional ones of Hellenic importation, such as beads, eggs, heart forms, spear heads, rosettes, acanthus or lanceolate leaves, the latter being very common; on the other being an important

collection of naturalistic motives taken from the native flora and fauna; leaves of laurel and oak, vine branches, honeysuckle, hawthorn, rose, lily, poppy, fruits, small animals, birds and insects. The human figure was far less utilized than in Greece. Roman taste was satisfied by the development on a facade, particularly on a frieze, of inscriptions, otherwise recommended by the beauty of the characters and skilful placing.

With mosaic, painted ornamentation succeeded best in Roman architecture. For from it was derived charming effects, admirable for richness of invention, harmonious variety in composition, elegance of form, pleasing motives, freedom and vivacity in coloring, and finally sureness in execution. It loved first the compositions of an architectural character, then under the influence of Alexandrine taste, sacrificed more and m more to caprice, and ended by pleasing itself by the most Barocco inventions.

The ordinary arrangement of a mural painting comprised the
517 distinction of three zones in a vertical sense. A dado, averaging a sixth of the total height, was ket in a dark tone; at first treated in the image of an architectural elevation, it was later divided into panels variously colored. At top was formed a light frieze, sometimes white, relieved by running o ornamentation. The intermediate surface was frequently divided in three panels; the middle one was narrower and exhibited a fanciful architecture, that often enclosed the representations of a mythological subject, a genre scene or ideal landscape; the decoration of the two lateral surfaces was more simple, generally composed of small paintings or of medallions, in which was inscribed a head, a cupid or birds. Ordinarily the o
518 ornamentation was carried out in clear yellow, red, green and white on the darker grounds tinted a warm red or brown, frank blue or black; but sometimes the arrangement of the harmony w was inverted. Frequently the effect was enhanced by reliefs in stucco or plaster, sometimes modeled by skilful and ingenious fingers. The entire appearance pleased the eyes and amused the mind.

BIBLIOGRAPHY.

See the original text of the work.

(Omitted by accident from page 135, as there noted).

184 Finally, from the "middle Minoan"epoch, a palace possessed a theatre, formed by steps rising as a border around an area paved with slabs, and which doubtless served for plays and dances. (116; 119).

In regard to the house, its form and arrangement as revealed by the representations presented by the faience plaques discovered at Cnossos recall European rather than oriental types; they indeed comprise stories and windows on the facade, and even roofs in two slopes, sometimes surmounted by a lookout(120).

Crete realized a modest sepulchre by excavating in the rock a chamber at the end of a corridor; by constructing underground with stone slabs a cist 3.28 to 4.25 ft. long, 2.3 to 3.28 ft. wide and about 3.28 ft. high; or again by excavating at the b
185 bottom of a well a side recess. A monumental programme, specimens of which are offered by the great Tomb of Isopata and t that of Hagia Triada, involve the construction of a subterranean funerary chamber of rectangular plan with a vestibule and a passage for access.[1]

Note 1. The Tomb of Isopata measures 25.7 ft. in length, 19.9 ft. in width and 26.2 ft. in height; the vestibule is 22.1 ft. long and 5.4 ft. wide; the dimensions of the passage are 78.8 and 6.6 ft.

IV. Construction.

Primitive Cretan construction appears to have employed no m material other than wood; when developed, it continued to make a considerable use of this.

Likewise for earth; the utilization of it was ancient, constant and regular, either for the filling of a framework of carpentry, for the preparation of a concrete of rubble, or for m moulding crude bricks, whose dimensions as found at Cnossos a are 17.7 ins. square with a thickness of 4.7 ins.; or finally, for the manufacture of a very fine and well burned pottery, t that can be appreciated from the sewer pipes uncovered at Cnossos.

Yet stone construction was familiar to Cretan architecture. At first, according to the "first"palaces of Cnossos and of Phaestos, it was limited to easely cut gypsum; in the epoch of the "second"palaces at the same places, -- doubtless as a res-

result of perfected tools -- it preferred limestone, at least for parts exposed to the weather.

If the treatment of the rubble was very crude, often being limited to simple roughing, on the other hand the cut stone w was the object of the greatest care, being defined by well dressed surfaces and sharp edges (114). Current dimensions were; in length 3.28 to 4.92 ft.; in width from 1.64 ft., and in height from 1.64 to 2.4 ft.; but lengths of 5.6 to 8.2 ft. and heights of 3.28 ft. were not rare, and they were not embarrassed by shaping great monoliths, such as those in the walls of the storerooms of the Palace of Cnossos, which measure up to 13.1 ft. long, 2.4 ft. wide and 3.28 ft. high.

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MANUALS OF THE HISTORY OF ART

ARCHITECTURE

Mediaeval and Modern Oriental

By

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Illustrated by 145 Engravings, 37 Maps and 819 Diagrams

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Introduction.

I. The arrangement of a history of mediaeval and modern architecture is controlled by threefold requirements.

It is necessary to commence with the East, and the extreme East. Indeed, not before the beginning of the second thousand years from the Christian era in the West did the art of building acquire a limited knowledge. At that date in the West, t the South and the East of Asia, in the basin of the eastern Mediterranean; finally in the vast area of Mohammedan civilizations had already been multiplied the brilliant proofs of a robust and fertile maturity(Fig. 1).

There should be connected with the East the activity displayed during the middle ages by the countries around the eastern Mediterranean, that in antiquity the triumphant course of Hellas had subjected to the supremacy of Egean genius. [1] For if Byzantine production proves that the force of the latter was surely weakened, it no less attests that its impulse was then diverted by an energetic expansion of Asia.

Note 1. See Volume I of this work, devoted to antique architecture.

Finally, it is proper to not attempt the mediaeval West only after having pursued -- as suited to the case until the end of their careers or until our own epoch -- the different schools of the East and the Extreme East. Their presentation in a group -- as they occurred, within the scope of the second volume of this work -- corresponds to the twofold fact, that they are allied by some common tendencies, and that all were in various degrees, directly or indirectly, influenced by radiation from one or more centres of art, formed in the Mesopotamian-Persian region by the Chaldean, Assyrian, Achemenide, Hellenistic, Sassanian and Mohammedan civilizations.

The examination of the material of this Volume forms a logical progression in six stages.

The first division of our plan rightly belongs to Mesopotamian-Persian architecture in the Parthian and Sassanian epochs.

A second Book will be devoted to the Christian architecture of the mediaeval East, which follows from the preceding in a certain measure.

II. We shall successively examine:--

Part first, the principal Christian architectural styles of western Asia and of north Africa -- those of upper Mesopotamia, Syria, Asia Minor outside of the Egean, and of Armenia, which afford evidence of invention.

Part second, the secondary Christian architectural styles of western Asia and of north Africa -- those of Mohammedan Arabia, Coptic Egypt and north Africa, whose iniative was less and dedependence was multiplied.

Part third, Byzantine architecture, the representative of t the third epoch of Egean architecture, and which combined with the Egean spirit the borrowed elements, some actually Hellenistic-Roman, others from Syria and from Christian Asia Minor, with the last from Mesopotamia and from Persia.

In Book third, we shall study the eclectic architecture of Mohammedan civilizations, that owes more or less to most of t the preceding.

A fourth Book will collect the eclectic architectural styles of eastern Europe, delayed and under obligation to the elder Byzantine, Armenian and Mohammedan; on the one hand, of Russia, on the other, those of Servia and of Moldo-Wallachia.

In a fifth Book will be grouped architectural styles, which betray influences from Mesopotamia, Persia and Greece, but manifest a profound originality; these are the architectural styles of southern, central and eastern Asia.

We shall further examine in:--

Part first, the architectural styles of Brahmin and Buddhist India and of China, that demand this in threefold regard to a age, duration, extension and radiation.

Part second, the architectural styles of upper Asia, that depend on India and China; those of Indo-China and of Indonesia, satellites of India; lastly, that of Japan, which proceeds from the Chinese.

The materials for Book sixth is presented by the indigenous architectural styles of America, Oceanica and Africa.

June. 1912. Francois Benoit.

VOLUME II. ORIENTAL.

1 Book I. Architecture in Mesopotamia and Pessia in the Parthian and Sassanian epochs.

Chapter 1. Requirements. -- Monumental Chronology and Topography.

From the beginning of the 4 th century B.C. to the beginning of the second third of the 7 th century A.D., the country of Mesopotamia and Persia was the scene of an intense industrial and commercial activity, of an ostentatious civilization and of a grand political flight, manifested in the brilliant fortunes of the empires of the Seleucids (306-130), Parthians (130 B.C.-226 A.D.) and Persian - Sassanian (227-641).

Our knowledge of the artistic production under the Seleucids is very little. We only know, that under the government of t these princes, the energy of the Hellenic conquerors inspired a civilization, which had been slightly depressed under the last Achemenides; that the country of the Tigris and the Euphrates was alive and prosperous, in a state to pay the cost of dazzling luxury and Magnificent princely and aristocratic pomp.[1]

Note 1. Seleucia, capital of the empire, was founded in 306 B.C., sacked by Romans in 116 and in 165 A.D., destroyed by t them in 198, having even 600,000 inhabitants.

The dynasty of the Arsacides included warlike, powerful and rich princes, ready to erect military and secular, useful and luxurious structures. But our evidence is rare and of little significance, composed of the vestiges of a Temple at Kingawar[2] of the remains of palaces at Assour and Susa; of funerary mon-
2 uments at Warka; and particularly of the ruins of Hadr (Hatra), which was a strong and wealthy city during the two first centuries A.D.[1]

Note 2. On the route from Bagdad to Hamadan.

Note 1. Hatra, that Sapor I destroyed in the middle of the 3 rd century, owed its prosperity to its position at the point where the route from the Persian gulf branches toward Persia on the one hand, and toward Asia Minor on the other.

The small amount of information possessed by us concerning the architectural work of Mesopotamia and Persia under the government of the Sassanides, reveals that it was considerable and important in certain respects, particularly under princes

like Chapour (Sapor) I (240-271), conqueror of the Romans; Va-
haram V Gaur (418-438), whose reign was beneficial; Chosroes
Anouchirvan (531-579), an excellent sovereign, victorious, wi-
se and refined; Chosroes II Purviz (591-628), who dominated A
Asia from the Indus to the Mediterranean and from Arabia to t
the Black Sea, architecture benefited from the fortunes of sov-
ereigns, exalted and enriched by fortunate wars, by a great n
national and religious enthusiasm,[2] and finally by unusual pr-
osperity. Its career ended at the same time as that of the S
Sassanian empire, destroyed by the expansion of Islam (641).

Note 2. The Sassanides claimed descent from Ahuramazda and
posed as champions of his religion.

The evidence -- at least in the present state of science --
is confined to a strip of territory extending between the pla-
teau of Iran on the one hand, and on the other being the Tigr-
is south of Mossoul, and the Persian gulf. The structures fo-
rm four groups:-- one located in the south in Fars; another in
Susiana; the third in the north of Lauristan; the last being
in the region of Bagdad.

As much as in the Achemenide epoch and for the same reasons [3]
there is a lack of religious and funerary monuments. On the
contrary, there exist very considerable remains of domestic e
edifices and of works of public utility.

Note 3. See Volume I, page 394.

3 In Fars is known the Palace of Sarvistan on the route from
Shiraz to Bender Abad, and that of Firouz Abad on the route
from Sarvistan to the Persian gulf. [1]

Note 1. By reason of the authority, that without speaking
of the particular competency of M. Marcel Dieulafoy, his opin-
ion derives from the fact of having resulted from the examina-
tion of the ruins themselves, it is proper to note, that the
learned author of the Art Antique de la Perse estimates the c
construction of the Palace of Firouz Abad as preceding the Par-
thian epoch, and even the Macedonian conquest. He likewise h
has in press a special study of this very important question.

We take the opportunity to make a correction in the Note pla-
ced at the bottom of page 388 of Volume I of our work. An er-
ror caused a mistake in attributing to M. Dieulafoy the placing
of the erection of the Palace of Sarvistan in the Achemenide

epoch, even when he believes that it may be dated from the 4 th or 5 th century A.D.

In Susiana the dykes of Karoun, the piers of the Bridges of Dizfoul and Chouster, date from the reign of Chapour I; on the banks of the Kerka exists a fortion of a Palace, the Tag Eivan.

In the north are to be seen:-- near Zohab on the route from Kermanshah to Bagdad, at a place called Kasr-e-Chorsov,[2] two palaces of Chosroes II Purviz, one large (AmasatAi-Chosrov), and one small (Kal'a-i-Chouar Kapi), protected by a fort (Kal'a-i-Chosrov); a little north of the last place being a palace, contemporary with those just mentioned, that the natives call Haouch-Kouri; on the same route and near the pass of Zagros is a Sassanian triumphal monument, the Takht-i-Ghirra, and another near Kermanshah, the Takht-i-Bostan; in the valley of Sein Merre are numerous remains of cities, -- notably at Chirvan a and particularly at Derre-i-Chahr, which was Badaka, and a palace at Kal'a-i-Hazar-dar. Finally and especially in a bend of the Tigris on the site of Ctesiphon -- a twin city of Seleucia -- which was the capital of the Sassanides and one of the wonderful cities of the East, celebrated for its gardens, its wealth and the splendor of its palaces, still stands a part of the residence of Chosroes I Anouchirvan, the grand Tag-e-Kesra [3]

Note 2. Chirin was the name of the wife of Chosroes II.

Note 3. Ctesiphon was founded a little after Seleucia, grew opposite it, and survived the ruin of its elder sister, completed by the Romans at the end of the 2.nd century.

Chapter 2. Conditions. -- Influences. -- Radiation.

We have defined in Volume I of this history the conditions provided by nature for the architects of the Parthian and Sassanian epochs.[4] On those of the human and technical order, we lack information. Yet it is certain, that the sovereigns disposed of the same facilities for the supply of costly materials and of labor, as their predecessors at Babylon, Nineveh, a and the Achemenides.[1] On the other hand, the quality of the s systems of covering applied by Parthian and Sassanian constructors, the taste of these for harmonious effects obtained by calculation and by geometrical constructions,[2] assume an intellectual domain, a faculty of invention and a pretty high s scientific culture.

Note 4. Volume I, pages 117, 392.

Note 1. Volume I, pages 118, 119, 392.

Note 2. See page 19 in this volume.

In a general way may be distinguished two schools; a Mesopotamian, commended by Hatra and Ctesiphon, and a Persian, honored by the edifices of Fars, Susiana and Lauristan.

In Parthian architecture and still more in the Sassanian may be recognized shoots from the ancient Mesopotamian trunk with a Persian graft. Their development was doubtless influenced by foreign arts. Parthian decoration borrowed most of its motives from Hellenic art in a more or less denatured form, which was presented to it by the Grecized colonies of Seleucia a and of the Bactrian cities. The Sassanian school did likewise, although in very restricted measure, and it had some obligations to Byzantine art.

On the other hand, the extension of the Seleucid empire and of those succeeding it in some localities, even to the Mediterranean, the confines of Egypt, the Persian gulf and far into central Asia, first made of Seleucia, and then of Ctesiphon a world marketplace, an exchange of ideas, where were crossed t the original currents of eastern Asia as well as of Egean Regions.

Yet the Mesopotamian-Persian styles, whose activity was displayed after Alexander's expedition, particularly those of the Sassanian epoch, were alive and innovating. Since the native peoples were remarkable gifted and were sustained by the trad-

6 traditions of more than two thousand years, the various artistic importations acted as ferments and reagents, determining a new career of national genius and a fertile boiling up of inventions.[1]

Note 1. From the lack of the manner and procedure of these inventions, which will be known only after the excavation of the ruins of Seleucia and of the cities, which flourished in upper Mesopotamia, their reality and their nature are revealed to us by the Parthian and Sassanian monuments of Mesopotamia, of Persia, and of western Asia derived from them.

We have already indicated the universal radiation of these schools. Let us recall that it affected central, southern and eastern Asia as well as western Asia and Mediterranean Europe; the art of China as well as that of India; Hellenistic and Roman architecture as well as Christian and Mohammedan, in Syria, Asia Minor, Armenia, Egypt and the Egean region.[2]

Note 2. See the Introduction.

Chapter 3. Programmes and their Realizations.

Conditioned by the climate and by the customs of the East, the preparation of a programme for a Persian or Sassanian palace tended to protect the residence from the excess of heat and light, as well as against curiosity and human enterprises; also to isolate both places for stately life, for private existence, for storage of provisions, lodgings for servants and f for domestic animals.

The facades were solid, air and light only being received f from the courts. An energetic ventilation was furnished by m means of fireplaces and by pottery tubes passing through the vaults (10,5). In the burning regions of Mesopotamia and of Susiana, the elevation comprised for the hot season a ground story with vaulted halls without windows, and for the cool hours a largely open story, accessible by stairways or by inclined corridors (5).

An imperial or princely seraglio (6) had as its essential part a divan, suited for audiences and state purposes, other-
7 wise called a great hall, equivalent to the "apadana" of Achemenide Persia [1] and the "talar" of modern Persia. [2] In Mesopotamia, this war designed at a grand scale [3] as a rectangular interior, deep and lofty, opening upon a vast court; doubtless it could be closed by porticos (6,1;5; 8) [4] In Persia a square hall was accessible through a great vestibule, extending almost as high as the facade and open for its entire height, sometimes in communication with lateral antechambers,[5] or again preceded by a columnar portico.[6] (5,52,3,6).

Note 1. See Volume I, page 394.

Note 2. See page 212, later.

Note 3. At Ctesiphon the useful area of the throne hall is a little more than 13,400 sq. ft. (158 × 85 ft.). At Hatra, the sides are 98 and 48.5 ft.

Note 4. Note the persistence of this room opening on a court in the Persian programme of the mosque; also page 215).

Note 5. See the Palace of Firouz-Abad; the Kal'a-i-tchaouar Kapi at Kasr-e-Chirin.

Note 6. See the great Palace of Kasr-E-Chirin.

Isolated from the state apartments and provided with proper passages, the harem comprised large halls well protected from

heat, and chambers sometimes rather small, around one or more courts (6,3; 3,6; 6).

A programme of a Parthian or Sassanian palace normally comprised a great extent of gardens, with large areas of water and a park enclosed by walls.

The enclosure of Hatra, the fort of Kasr-e-Chirin, indicates that a Parthian-Sassanian fortification comprised behind a wide moat, walls sometimes doubled and flanked by round or square towers.(7).

In what concerns the public works, the science of Sassanian engineers is attested by the quality of their hydraulic undertakings, and particularly by the solidity of their bridges, w which have resisted till our time the formidable attacks of t the torrents spanned by them; that of Chouster measures no less than 1690 ft. and counts 41 arches (13).

8 9 The Takht-i-Bostan and the Takht-i-Ghirra authorize the hypothesis, that Sassanian freely realized a memorial monument in the form of an open chapel with one or more aisles.

As for the Parthian temple, the vestiges of that of Kingawar reveal that its programme isolated the sanctuary in the middle of a great rectangular court surrounded by porticos.[1]

Note 1. Compare the taste of the Hellenic architecture of Asia Minor for this arrangement. Volume I. Page 280.

Chapter 4. Construction.

Parthian and Sassanian architecture were very expert in the art of building; particularly the second, to which it is doubtless necessary to give the honor of the first practical solution of the covering of a square interior by a calotte with a circular base.

I. Materials.

The favorite material of the Parthian and Sassanian masons
10 was clay, moulded in squares measuring on the average one ft. (11.8 ins.) on each side and 3.2 ins. thick, which were employed crude or burned, according to the loads imposed on the structure.

In the ancient Assyrian country, rich in limestone -- witness the ruins of Hatra -- stone was used as cut stone and rubble. Likewise in the mountainous regions bordering Iran, where in the lack of clay, were used boulders, abundantly contained in the alluvium of the valleys; they were sometimes employed rough; sometimes by cutting in slab form, a shape was given to them analagous to that of bricks (9,1,2; 10,1). On some occasions -- witness the Palace of Sarvistan -- stone and burned b bricks were associated in the same edifice; the first served for the walls and the second for the vaults.

Lime was in common use, and it entered into the composition or a remarkable mortar. Particularly in Persia, enormous use was made of gypsum, both for the joining of rubble and for making stucco coatings, as well as for casting ornaments (9,1,2,6).

In a general way, the use of wood was reduced as much as possible; in many regions it was exceptional. On the contrary, metals were lavished for ornamental purposes.

11 II. Procedures.

Wall and Portico.

In Mesopotamia, construction was conscientious and intelligent. The facings in cut stone for walls were set dry with care and success, the nucleus being economically constructed of a mass of rubble. [1] The facades of the Palace of Hatra reveal, that it practised the reenforcement of walls by the aid of buttresses, and the facade of the Palace of Cteriphon attests, t that it understood how to ensure the stability of a panel of masonry by the threefold expedients of an elevation with reces-

recesses, a framework of buttresses and arcades, and finally an internal bonding by courses of beams.(9,3,4,5; 8).[2]

Note 1. See the ruins of Hatra.

Note 2. At Ctesiphon the bonding was formed by beams with ends connected by keyed splices and iron bands. They were placed in spaces carefully constructed and ventilated.

12 In the entire extent of the area of Parthian and Sassanian architecture, a mass of rubble was connected by gypsum or lime mortar.(9,1,2). Sometimes this procedure was applied to cut stone.[1]

Note 1. See the piers of the Bridge of Chouster.

They understood how to realize the shaft of an isolated support by an artifice familiar to primitive Chaldea,[2] that of a pile of bricks partly recut, which was covered by a coating of gypsum.(9,6).

Note 2. See Volume I, page 135.

For an opening, although the method of the relieved lintel was practised,[3] it was usually spanned by a voussoir arch, semicircular when the span was small, sometimes pointed in case of a wide opening; more frequently an elliptical curve, which will be more accurately defined later.(Page 20). The imposts were carried as high as possible.(8; 9,1,2,4; 10; 11).

Note 3. See Hatra.

On account of the lack of wood, Sassanian constructors made shaft and succeeded in reducing to a minimum the preliminary carpentry. First they acquired the ability to suppress the greater portion by arranging to erect the arch behind the support, in order to secure a place for resting the ends of t the centering; after completing the construction, a covering of gypsum concealed the expedient.(9,1,2). A second artifice permitted the use of light forms; an arrangement of voussoirs with corbelled courses approaching their position diminished their clear span considerably.(9,1,2; 10,1).

The Covering.

Still, in the covering triumphed Parthian and especially Sassanian construction. It was realized in the form of vaults, tunnel or combined in calottes. The first system was the rule in Mesopotamia, where a masterly application of it was made.[5]

Note 5. The spans of the great tunnel vaults of the Palace

measure 48.6 ft.; those of the great hall of Ctesiphon have t the corresponding dimension of 88 ft.!

13/14 The erection of Parthian and Sassanian coverings was strictly conditioned by the scarcity of wood, which excluded the construction on centering. Doubtless there are examples of tunnel vaults built on forms;[1] but normally in the clear space w were fashioned shells, like those of the great nave of the Palace of Firouz-Abad and of the hall of Ctesiphon, whose clear spans repeatedly measure 40.4 and 85.0 ft. The method was the same as in Mesopotamian and Egyptian antiquity;[2] that by slices, starting from a head wall or an initial arch built on centering. A series of jointed arches were built, each formed of a row of tiles set endwise and connected to the preceding arch (10,8). The operation was facicilated by the energy and rapidity of the setting of an excellent mortar and also by three a artifices; the first reduced the number of unsupported voussoirs by carrying the horizontal courses ar high as possible (10, 2,8); the second favored the adhesion of the tiles to the pre- 15 ceding arch by inclining the slices backward; the last diminished the clear span by imposing on the vault a stilted profile.

Note 1. See the cut stone vaults of the Palace of Hatra and those of the side aisles of the Palace of Firouz-Abad.

Note 2. See Volume I, pages 71, 137, 138.

Sassanian tunnel vaults were strengthened by a division of their mass into several superposed shells, independent and of different construction; for example, that of Ctesiphon comprises no less than ten, the first four from the intrados being constructed in slices, and the others with radial joints.(1,2).

Against the risks of overthrowing the walls by the side thrust of a tunnel vault, various precautions were taken; localizing the springings on the internal faces of the walls, so that the exterior formed a projection (10,5); abutting the lateral tunnel vaults constructed perpendicular to the principal one (6,1); consolidation by internal buttresses, whose forms were sometimes very ingenious; such as those of the gallery of the Palace of Sarvistan, which united the arches and reduced the span by an arch in them near the ground (10,9).

Yet, it is particularly in the cowering by domes, that is manifested the constructive genius of Sassanian architects.[1]

We have mentioned in its time (Volume I, page 136) the knowledge of the system possessed by Mesopotamian architecture. But graphical documents indicate, that it was only applied at a s small scale.

Note 1. Recall that at Firouz-Abad the calottes are of rubble like the walls; while at Sarvistan, they are of brick, the walls being of rubble (10,6).

Sassanian domes are of great dimensions, [3] on the contrary, and reveal a very skilful solution of the problems set by that kind of vault. The thrust for the clear span was reduced by the choice of an elliptical profile, analagous to that of the tunnel vaults (10,5). The resulting difficulty from the disccord of the supporting square wall from a shell of circular p perimeter, and a square enclosure, was overcome by the aid of two expedients; first by means of an "angle trumper,", i.e., by an arch thrown across the opening at each angle and closing at the same level as the walls, determining an octagon; then by the aid of "pendentives," i.e., of concave triangles of masonry in the form of spherical triangles between the trumpets
16 and the supporting walls, they succeeded in ensuring to the c calotte a continuous support (10,6).

Note 3. Those of the Palace of Firouz-Abad have a clear span of 45.9 ft. and extend to 75.5 ft. above the ground.

The procedure revealed by the halls in stories of the Palace of Hatra (10,8), and particularly the gallery of the Palace of Tag-Eivan (10,4) is no less indicative of the ingenuity of Parthian and Sassanian architects. Indeed, by means of partitions raised on arches, the upper part of a hall is divided in compartments, whose covering is realized,either by a ceiling of s slabs -- that is the solution shown by the ruins of Hatra -- or by tunnel vaults, as at Tag-Eivan. Besides the advantage of subdividing the difficulty of covering a great interior, it again offers that of a localization of the loads and thrusts at a small number of points, which permits a better realization of the resistances and the piercing of wide openings in the intervals. [1]

Note 1. The expedient was known to Roman architecture and familiar to that of central Syria (page 54;,also Volume I, pages 486, 487, 493).That applied at Tag-Eivan is likewise to be

observed in the Romanesque Church of S. Philibert at Tournus. (Volume III). Besides, its threefold principle -- distinction between a skeleton of arches and the compartments; concentration and resistance of the destrictive [redacted] produced by the vault -- is eminently characteristic of the Gothic system. (Volume III). Was there an education of the West by the East, or merely a fortuitous meeting of two independent attempts? The first hypothesis is no less than improbable. (See M. Dieulafoy's Work).

17 Chapter 5. Effect.

Sassanian or Parthian, this wise architecture was al elegant as it iental sisters, and like them was more preoccupied with the internal earance than that of the exterior; loving better the effect of orna tion than that of relief.

Effects of Picturesque Order.

The vastness of its halls and its enormous porticos indicate a des to astonish by the manifestations of material grandeur, and one can deny to the conuments of Hatra, Kasr-e-Chirin, and particularly of C iphon, the possession in an eminent degree, of the picturesque quali the grandiose tone. What is more striking than the opening on the g facade, illuminated by the sun of the East, the opening filled with ow, of an arch nearly 83.5 ft. wide and 106 ft. high? (8).

Effects of Relief.

Although construction in bricks or rubble scarcely favored this, P ian and Sassanian arts sought the effect of secondary monumental rel
18 moreover in the Mesopotamian tradition of simple substructures (Volu page 142), crenelated cornices, and the animation of facades by pila or half columns. The ruins of Hatra exhibit a Hellenizing arrangeme bands, friezes, cornices and of spaced pilasters (3; 12,1,6); those Firouz-Abad a scheme of high and recessed arcades and of engaged col rising to the upper cornice (12,8); the facade of Ctesiphon, a more ersified composition, which develops in height three stories defined wide bands and each subdivided in two, with in a horizontal directio nels separated by half columns and enhanced by arcades.(8; 9,3; 12,7

The ordinary materials of Parthian and Sassanian were not favorabl obtaining effects by the relief of the details.

The usual shape of the isolated support was that of a cylinder sur ted by a slab. A luxurious programme comprised for a column the com tion of a capital and a base; for pilasters and piers, that of an im cap. The forms of the capital were frequently in the barbarized ima
19 of Hellenic types (3; 14,2,4,6); but Sassanian art also realized the uctural form of a truncated pyramid, relieved by sculptures on its f (14,1,3).[1]

Note 1. See on page 171 an analogous form of the Byzantine capita

The mouldings were simple, essentially composed of angular project by a hollow, a quarter round, or a great torus. (12,1-6).

Effects of the Harmonic Order.

One of the most characteristic traits of Sassanian architecture is

taste for effects of the harmonic order, resulting from putting the edifices in proportion by means of calculations,[2] and particularly by geometrical constructions.

Note 2. I. On O B (half span of the room) is constructed an Egyptian right-angled triangle O B A. With B D (= 2 O B) as radius, D C is described; then with A C (= O A), the arc C F E. The ratio of O F (= 2 O A) to B D (= 2 O B) is that of 3 to 4, like that of O A to O B.

II. The module is an Egyptian triangle constructed on A B (half clear span of an arch). The width of the hall (D E) = A B + B C. The height of the columns (F B) = A C; the height from the ground to the gallery (I P) = 2 F A + 3 B C. The diameter of the dome (M N) = H I = 2 A B + B C. The height of the springings of the trumpets above the gallery (R P) = A C. The rise of the trumpets (N R) = 2 A B. The ratio of the height of the dome to its diameter is that of 3 to 4, the same as that of A C to A B.

III. The module is an Egyptian triangle constructed on A B (half span of one of the arches before the walls). The height of the piers (E B) = B C; the width of the pier (E F) = B C; the height of the vertical surfaces (F H) = 2 A B + B C; the height above the ground of the springings of the vaults (F M) = K F = 2 A B + 2 B C; the rise of the trumpets (H M) = E F = B C. The profile of the arches and vaults realizes the ratio of 3 to 4, that of A C to A B. (From M. Dieulafoy's Art Antique de la Perse).

20 Thus the curve determining the arches and vaults is an oval with three centres, each radius having its length, the position of its pivot, and the magnitude of its displacement determined by an "Egyptian" triangle, otherwise stated, by a right-angled triangle, whose sides are to each other as the numbers 3, 4 and 5 (15,1).

On the properties of this figure were further based a shythmic formula, that guided the composition for the whole as well as for the details. Finally, all the dimensions were related to a unit of measure, a module. (See Volume I, pages 71, 75).

Effects of Ornamentation.

Parthian and Sassanian architecture were lavish with ornamen-
21 tation, particularly of all that derived its effect from color.

To mask the unpleasing appearance of the bricks or rubble, they sometimes had recourse to a facing of cut stone [1]; commonly to coatings of lime mortar and especially of gypsum, to panelings of terra cottal to hangings of fabrics, richly ornamented and in many colors, even to owerlays of silvered or gilded copper, and incrustations of precious stones. A great part was taken by ornamental and significant frescos. Some ancient texts arouse ideas of prodigious splendor. [2]

Note 1. See the ruins of Hatra (3).

Note 2. In regard to a Parthian palace, Philostratos writes:- "It was covered with places of copper, that reflected the rays of the sun. - - - Porticos were decorated like paintings, with fabrics embroidered with gold, framed by shining plates of silver and with plates of gold - - a hall was covered by a dome, internally faced with sapphires, shining with celestial brilliancy; on the blue ground of the stones were raised in gold t the images of gods".

As for the metallic overlays, the evidence of Philostratos is confirmed by numerous traces of fastenings observed on the walls of Hatra and of Ctesiphon.

Although essentially polychromatic, the ornamentation was also in large measure in relief, and it was further frequently realized by the economical method of coatings of gypsum. Sculpture failed in execution, which if the scale were small, presented the minuteness and dryness of goldsmith's work [1] (17), and in the case of large proportions, it was soft and heavy. in a general way, it preferred to the effect of relief that of a flat relief and of forms inliad by sinking. (1411,3; 17; 65).

Note 1. Sassanian goldsmith's work possessed remarkable skill, and its products were in demand in the extreme East as w well as in the extreme West.

Painted or sculptured, Parthian and Sassanian decoration abused details and pleased itself with monotonous, current or cowering compositions, scattered, in bands and as arabesques; indeed it was modeled on those of fabrics and of jewelry (14,1; 17; 18).

Besides a certain number of Hellenistic types -- acanthus, eggs (Hatra), more or less transformed, and Achemenide formulas, its repertoire notably comprised the tall hollow with sev-

several rows of flutes [3], a certain quantity of plant and ani-
23 mal forms changed by extreme conventionalization and by a mode of conventional presentation with regular and symmetrical arrangements (14,1; 16; 17; 18). Some possessed a symbolic value; vine branches (16), pineapple, tree of life, birsd or animals facing each other on opposite sides of the latter, or of a vase, a sign of the soucce of vitality. The image of man was n not excluded; the Parthian school took pleasure in animating the surface of a wall or of an archivolt by heads with a barbaric but powerful effect (3); the Sassanian loved allegorical personages. [1] But what it especially favored, and which form one of its characteristic traits, were fanciful figures with monstrous and strained forms with grimacing expressions, already dear to Parthian art.[2] Finally it adored geometrical themes and combinations; finials, palmatiums, rosettes, stars, disks, circles, zigzags, ribbons, imbrications, etc. (16; 17; 18).

Note 3. See Palace of Firouz-Abad.(Volume I, page 409).

Note 1. See facade of Takht-i-Bostan. Also Figs. 14; 16.

Note 2. See Hatra. The taste for monsters already appeared in the Mesopotamian and Achemenide epochs.(Volume I, pages 148, 422). As a result of the great exportation of the products of the artistic industries of Sassanian Persia, it was carried on with India and China, as well as with the Byzantine empire and western Europe, which imitated the types represented in the g goldsmith's work and the fabrics.(16; 18).

24 Book II. Christian Architectural Styles of the Mediaeval East.

The career of mediaeval architecture in the Christianized c countries of western Asia, of north Africa and of the eastern Mediterranean was determined in the greatest measure, on the one hand, by the number and nature of the requirements increased by the advance of the new religion; on the other, by the a action of the riwal esthetic forces, which constituted in the first two centuries A. D. the partial Hellenization of the peoples of Asia Minor, Syria and Egypt, the reaction of their national genius against the Grecian influence, and finally the radiation from the Mesopotamian-Persian East under its Parthian and Sassanian form.

Chapter 1. The Christian Impulse.

I. Requirements.

If the original Christianity had not been developed, its triumph would have been injurious to architecture. In principle, it reduced the religious rites to prayer and to works of charity, and it nomore conceived the need of a temple, than of a rite or a priesthood. "It is not the place, that sanctifies t the man", proclaimed one of its doctors; "it is the man who s sanctifies the place". Origen clearly stated; "we desire for our God neither temples nor statues, we leave these to the demons."

25 In truth, the need of an appropriate place was implied in t the institution of prayer in common, justly appreciated as the best means of realizing, for an instant at least, the ideal fraternity and the communion in the divine. But to cite the words of Denys of Alexandria, "all places were good; a field, an inn or a prison!" Practically was utilized the house of a wealthy member of the community or even a cavern in the catacombs.

Yet when the multitude of those affiliated compelled an enlargement of the "oratory"; particularly when the edict of 313, transforming the persecuted faith into the official religion, had carried it within the circle of imperial Roman solemnity, architecture was desired to erect assembly halls, otherwise called churches, which by their appearance as well as by their capacity, were appropriate to the new situation. The necessary

complement of an episcopal church, and from the 6 th century, that of many ordinary churches, was a baptistery.

On the other hand, as Christianity deviated from the spirit to the letter, was inclined to ritual practices turned to superstition, its dependence on architecture always increased. It needed churches commemmorating the events of the life of Jesus; funerary churches (cellae trichorae, martyria) in which to celebrate the anniversary of the beath of a saint or martyr -- a category with a prodigious development, when in the 6 th century became general the worship of relics; finally, innumerable chapels at places where the tutelary or malicious gods, disguised by Christian names, continued to be honored by the people people. Let us add that at places of pilgrimages were hospices (pandocheia, xenodochein); that the clergy were required to teach and required schools; also note that nothing was held more meritorious, than the erection of religious edifices.

From the 4 th century, the practice of hermit life, the invention of Egyptian devotion, was adopted with enthusiasm by Syria, Mesopotamia, Asia Minor, and soon by all Christendom, instituting an enormous demand for monasteries.

II. Religious Programmes.

Doubtles, more than one community yielded to the temptation to utilize the assembly halls of the constituted bodies of the empire or of the cities, especially the spacious basilicas [1] for the use of exchanges or courts, even the temples of the v vanquished deities.

Note 1. Volume I, page 458.

Note 2. The appropriation of the temple for a purpose the reverse of its own was realized in various ways. Sometimes the general arrangement was retained, adding an apse.(See Temple of Rome and Augustus at Ancyra, and the Parthenon); sometimes the intervals between the columns of the peristyle were w walled up, and by piercing doorways in the lateral walls of t the cell, there was obtained an interior in three aisles. (See Temple of Concord at Agrigente); sometimes was erected an enclosure concentric with the peristyle, which become the great nave after the removal of the cell. (See at Aphrodisias). As examples of the utilization of civil edifices, let us cite at Rome, S. Adrian on the Forum, (hall for the sittings of the

Senate), Holy Cross of Jerusalem (a hall of the Palace Sessorianum) etc.

It was no less fated, that the latter should furnish the models indicated for the new structures. 3

Note 3. For example, see what occurred at Gaza, when the b bishop S. Porphyrius decided to build a church there; the majority were of the opinion to erect it "in the image of the temple of the idol".

Yet the plan of the pagan sanctuary, the temple of a deity, could not satisfy the need of the new religion for interiors sufficiently vast to contain a multitude, and so unobstructed that no one should fail to see the altar and hear the sermon. Therefore the art of building not only owed to the accession of Christianity the opening of a grand career, but was further indebted to it for an energetic inducement to advance. Indeed, the religious programmes proposed to it comprised the satisfaction of numerous and varied needs, an active search for picturesque effects, and particularly the solution of problems resulting from the covering of a great interior.

Substantially, the worship required a consecrated enclosure; a preliminary space in which the faithful could prepare themselves, especially by washing the hands, "which prayer must raise toward God", for entering the "House of the Lord"; an arrangement of the latter permitting the clergy to deliver homilies and readings; for the faithful to participate in a communion commemmorating the Last Supper; finally, a distinct place for each class in the community; for the governing committee (priests) presided over by the bishop; for the supervisors of good works (deacons and deaconesses); for the active members (Christians); for the probationers (catachumens), who sometimes awaited their admission for years, and for the penitents, excluded for a longer or shorter time -- all authorized to listen from afar to the hymns and sermons, but excluded at the b beginning of masses and of the communion.

This programme was realized by Christian architecture in the basilica, whose primitive and normal composition was the following. (19,1).

27 The church proper was preceded by a great court (atrium, paradisus, parvis), almost always square; and whose entrance was

sometimes monumental (propyleum); a basin (cantharus, phiale) occupied its centre, and it was surrounded by porticor. This area before the facade was occupied by probabioners (catachumens) and penitents, to whom the use of great curtains placed at the doors allowed or prevented a view of the church, according to the place in the ritual. Also frequently and especially in the East, they found places in a vestibule (narthex) occupying the entire width of the edifice. This, the basilica proper, generally comprised three and sometimes five aisles, separated by columns supporting the roof. The middle aisle w was wider than the others (collaterals, side aisles), which it exceeded in height, so that a space resulted in which to p pierce the windows. In the East the left side aisle (with reference to the faithful) was reserved for the women (gynaikon).

At the rear end of the greater aisle was the place of the sanctuary, denominated in the West, sanctuarium, presbyterium, tribunal [1] or concha; in the East, adyton [2], abaton [3] or bema. [4] This was a semicircle (apsis, apse), provided with a bench on which sat the priests, with a throne (cathedra) for the bishop, at the middle of the curve. The dignity of the place was indicated by a great arch (arcus triumphalis), crossed by a beam supporting a cross and a chandelier. Before it and on the axis of the edifice was an altar, sheltered by a columnar pavilion (ciborium), whose openings could be closed by curtains. Between the altar and the area occupied by the faithful (quadratum populi), a space for the singers (chorus psaltentium, s schola cantorum) was enclosed by a barrier (cancelli), at the sides of which projected two pulpits (ambons) for the reading of the sacred texts and the sermon.

Note 1. Because of the analogy of its purpose to that of t the corresponding part in the Roman civil basilica, where the judicial magistrate sat. (See Volume I, page 459). Also Vol. III

Note 2. The secret place.

Note 3. The inaccessible place.

Note 4. The platform, because its floor was raised by one or more steps.

The establishment of a **gallery at** mid-height in the elevation of the side aisles was very rare in the West, but was appreciated in the East for the facility it afforded, both for placing notable persons apart from the multitude and for applying

the oriental principle of separation of the sexes, by restricting the women to the gallery (gynaikonitis).

In the East, where the worship comprised more ceremony, and where in the course of the 5 th century was developed a part of singing and one of drama [5], at the expense of homoletic instruction, the programme just analyzed introduced complicatioons (19,2; 91,7). On both sides of the apse and opposite the side aisles were opened apses, that on the South being the diakonikon or apodosis, and that on the North being the prothesis, the former serving as a sacristy, and the latter as the p place of preparation of the sacred articles, which at the proper moment were solemnly borne into the sanctuary. ("Grand entrance"). On the other hand, the sanctuary was closed by the sceeen of a portico with curtains or a high barrier for exposing the sacred images (pergula, Iconostasis), in the middle of which was placed a "sacred gate".

Note 5. Commemmoration of the Passion by the eucharistic s sacrifice.

Note 6. For the orientation, see page 29.

The need of a presbytery of large dimensions -- particularly urgent when the church was monastic -- or the desire for finding place for the tomb of a martyr sometimes determined the i
insertion between the sanctuary and the nave, of a transverse
aisle (transeptum), which might project beyond the lateral wa-
29 lls of the edifice, sometimer terminating in an apse, like the
great aisle. [1] (19,3).

Note 1. Evidently the plan of the Christian basilica was d derived from that of the edifice of the same name, that in the Hellenistic cities and at Rome served as forum, exchange and tribunal. Volume I, page 458.

Chapels were often consecrated to the archangels Michael and Gabriel, particularly regarded in the East as "attendants at the throne of Christ" and guardians of the "House of God on e earth"; so they were freely placed on towers adjoining the church or not, that from these elevated posts, they "could see everything at all times"; as for bell towers, no mention of t them is made before the 7 th century.

The baptistery was near the church. Often designed on a great scale, in accord with the importance of the ceremony of w

which it was the scene, and with the practice of total immersion of the converts, its programme normally distinguished a v vestibule, in which the proselytes renounced Satan, and a hall, in the centre of which was excavated a font.

Memorial and funerary churches were frequently realized on a concentric or radiating plan; this was sometimes a rotunda or octagon, which might be extended by an annular side aisle sometimes containing galleries (19,8); sometimes a basilica w with triple sanctuary (trichora cella, triconchos sigma), i.e., furnished with three apses arranged in cross form, according to an arrangement adopted from the throne halls of oriental a and Roman palaces [2] (19,6); sometimes a cross-shaped nave (19,7). Rarely, the plan was that of a pasilican type, differentiated by the addition on the front end of an apse symmetrical with the normal one (19,8). The relics were preserved in a crypt (martyrium, confessio, crypta), accessible by a stairway.

Note 2. See the Palaces of Treves, Milan and Maschita.(See plan of the latter, Fig. 63,7.

The elaboration of Christian religious programmes employed in large measure symbolical preoccupations; thus although the rule permitted exceftions, particularly in the early times, t the officiating priest must face the East. At first the primitive rite placed him facing the faithful, so that the church found itself located like the pagan temple, i.e., having its entrance at the East (19,4). From the 5 th century, a ritual revolution originating in the East reversed the position of t the with his back toward the faithful, so that the orientation was reversed, and the axis of the church extended from West to East (19,5).

30 Frequenhly and especially in the East, the proportioning of the edifices was influenced by the desire of employing the mystical numbers, 3, 7, 8 and 12. [1]

Note 1. 3 = the Trinity; 7 = seven days of creation, the s seven gifts of the Holy Spirit, and the seven sacrements; 8 = eight beatitudes; 12 = the apostles.

Similarly for the plan; the octagonal form, so frequently a applied to the basilica, was recommended by the meaning attributed to the number 8. [2]

Note 2. See Latin verses in text attributed to S. Ambrose or S. Ennodius.

Particularly and especially in the East, was a tendency to shape the church in the image of a cross, for the same reason that imposed on a person praying the lateral extension of the arms. [3] (19,7).

Note 3. "Our prayers will be quickly heard, if our body represents Christ, who thinks of us." (S. Ambrose).

Let us examine some significant texts.

Chuciform churches are expressly mentioned as "in the image of a cross." Describing a church projected by him, S. Gregory of Nyssa writes, that it is (see text). Adamnus-Arculph says of a church in Palestine, that"it is in four parts, in the image of a cross." The life of S. Porphyrre recalls that the Church of Gaza is in the form of a cross. In regard to the S. Apostles at Constantinople, Procopius observes, that the plan comprises the crossing of the two axes in the shape of the cross, and that the eastern arm is elongated, by which the form of the cross is sufficiently produced.

Zonaras informs us, that Justin II added to the Basilica of S. Maria of Blachernes an apse at the north and one at the soouth, "in order that the church should be in the shape of a cross (see text).

The inscription prepared by S. Ambrose for the dedication of the Apostles built by him at Milan about 382, is sufficiently explicit. (See Latin original in text of Note).

Chapter 2. Esthetic Impulses.

The development of mediaeval architecture in western Asia, northern Africa and in the eastern basin of the Mediterranean, we have stated to be conditioned by concurrent influences, composed on the one hand of Hellenism and its extensions into Asia Minor, Syria and Egypt; on the other, of the peculiar temperament of the peoples of these countries, and the radiations of Mesopotamian and Persian genius under their Parthian and S Sassanian forms.

3/ Hellenism was one of the forces of Christian civilization in the places considered by us. In the Egean region, the theatre of Byzantine life, its effect was as powerful as prolonged. In Asia and in Africa, although not equal by much, it was no less real and general; favored by the establishment of immigrants and of Grecian sovereigns after the expedition of Alexander, it kindled in those countries -- particularly at Ephesus, Antioch and Alexandria -- ardent centres of Hellenizing civilization, more or less impregnating with its spirit the superior class, to which must fall the dogmatic and priestly direction of Christianity.

Yet it was necessary for the esthetic ideal of these colonies of Hellas to respond to what the latter had conceived. Far from manifesting the native taste, the Hellenic importation a adapted itself to this. There resulted from it hybrid formulas, that illustrate, for example:-- in Asia Minor the placing of churches in the centre of an enclosure surrounded by internal porticos; [1] in Palestine, the alliance of Grecian and Phoenician-Semite elements exhibited by the tombs of the vicinity of Jerusalem; [2] in Syria, monuments of the Roman period with entablature raised in an arch above the central intercolumniation, with abundant ornamentation and flat sculpture; [3] at Alexandria, the fanciful monumental relief, an idea of which is given by the mural paintings of Pompeii and the Nabatean ruins of Petra. [4]

Note 1. Volume I, page 280.

Note 2. Volume I, Book 4, second Part.

Note 3. Volume I, Book 4, Part 2.

Note 4. Volume I, Book 4, Part 2.

More efficient still was the competition offered to Hellenism

by the revived Mesopotamian-Persian, that we have already defined. Indeed, from about the beginning of our era, whatever aspect of civilization be considered, there is observed an increasingly energetic radiation from the genius of the Mesopotamian and Iranian peoples over the Greco-Roman world. In the domain of economic, religious, social and political life, it is marked by an afflux more and more considerable, of the natural or manufactured products of central and eastern Asia; by a rapid propagation of the worship of Mithra as far as the eastern frontiers of the empire and by an incessant advance in l
32 luxury; by the completed organization, in the time of Diocletian, of an entirely Asian administrative pomp; by the establishment of Diocletian at Spalato and of Constantine at Byzantium. As for the architecture, it is manifested by the introduction of construction in burned bricks into Asia Minor, and even to Rome; [1] by that of the domical covering into Asia Minor, Syria and Rome; [2] by the fashion of abundant ornamentation, of flat sculpture, of adventitious ornament, and of the polychromy, for example, that is revealed by the monuments of Syria, of Alexandrine products after the beginning of our era, the P Palace of Diocletian at Spalato, etc. [3]

Note 1. Volume I, Book 4, Part 2.

Note 2. Volume I, Book 4, Part 2.

Note 3. Volume I, Book 4, Part 2.

This reaction of the native original ideas, that expansion of the Mesopotamian-Persian East, must benefit the career of Christianity. Was the new religion not an invention of the o orientals of Palestine, developed by the orientals of Syria, Egypt and Asia Minor? Was it not fated to behold in Hellenism and detest an appearance of the abhorred paganism? [4]

Note 4. For example, compare the Hellenophobia of the Alexandrine clergy, revealed by the barbarous destriction of the monuments of the city and the murder of the philosopher Hypatia (425 A. D.).

33 Part I. Principal Architectural Styles of Western Asia and of Christian North Africa.

Section I. Christian Architecture in Upper Mesopotamia and Syria.

1. I. Architecture in Upper Mesopotamia.

The history of the architecture found in upper Mesopotamia forms a transition between the study of the Sassanide East and the Christian East. Scarcely commenced, the architectural exploration of that region (21,2), which under the name of Osrhoene was at the beginning of the middle ages a centre of civilization and a focus of Christianity, has revealed monuments of the greatest interest; at Wiranschehr (Constantina), a great c church (5 th - 7 th centuries); at Diarbekir (Amida), which r rivaled Edessa and Nisibe, two notable churches (5 th - 7 th centuries) -- the Nestorian Church and Church of the Virgin; in the canton of Djebel Thur Abdin, southeast of Diarbekir, v various sanctuaries and monasteries (5 th -7 th centuries),-- Mar Augen, Mar Gabriel, Mar Yakoub, El Hadra at Kakh, etc.

34 These churches consist of a nave, sometimes elongated on the axis of an Eastern apse (20,1), sometimes transversely with t three sanctuaries (20,2).[1] There also exists a central and r radiating plan, which forms a square beneath a dome, opening into four halls in cross form (20,3,4; 28,5).

Note 1. Transverse naves were common in ancient Mesopotamia. See Volume I, Fig. 77.

The construction is often of very good quality, applying Mesopotamian-Persian methods. The walls are of well jointed stones; the openings covered by a lintel or a frequently stilted arch, sometimes raised or even slightly pointed in Persian form. The covering is protected by a roof in two slopes covered by tiles, and is either a tunnel vault with a stilted or elliptical curve or a dome, sometimes on an oval plan (20,4). This was fitted to its support by trumpets, and was made of bricks connected by thick beds of mortar. It is the same for the tunnel vault above the point -- carried as high as possible -- at which the horizontal courses cease.

The effect is required from mouldings with contrasted profiles; from wrought capitals; from abundant ornamentation consisting of sculptures in low relief, but sunken, paintings and m mosaics. The decoration associates Hellenistic, Persian and

symbolical motives -- acanthus, rosettes, scrolls enclosing a animals, vine branches, the vase of life etc.

II. Architecture of Christian Syria.

Chapter 1. Requirements. -- Monumental Chronology a and Topography.

Much more thickly inhabited than in our time and indeed cultivated beyond the actual limit of the desert; enriched by a great commerce in the transit of the products of Mesopotamia, Persia, India and even of China, to destinations in the Mediterranean countries, Syria offered to architecture from the beginning of our era and for six and a quarter centuries a vast and varied career. For the wealthy citizens were required beautiful dwellings and monumental tombs; the number of the cities increased in astonishing proportion in the 4 th, 5 th and
35 6 th centuries, [1] and these required useful or luxurious arrangements, the taste for which they contracted under Roman administration; [2] finally churches and monasteries in abundance, for a population that passionately professed Christianity from the 4 th century, and was a nursery of priests and monks.

Note 1. In northern Syria are counted in an extent of forty leagues a hundred new cities dating from that epoch.

Note 2. Volume I, page 437.

The series of structures for religious purposes was begun in the second quarter of the 4 th century under the energetic impulses of Constantine and of the empress Helena. In every locality of Palestine made sacred by some event of the life of Jesus were erected churches, "as tokens of the victories of t the Lord"; [3] -- Churches of the Annunciation at Nazareth, of t the Nativity at Bethlehem, of the Holy Sepulchre at Jerusalem, of the Ascension on the Mt. of Olives. Elsewhere were erected, at Antioch the "Great Church", founded in 331 and finished under Constantius, basilicas at Tyre and Damascus; in northern Syria the churches of Hass, Kherbet Hass, Roueina and of Fafirtin (372); in the Hauran those of Oum-idj-Djemal (345) and of Tafka.

Note 3. The comparison is that of S. Jerome.

The work of the 5 th century is known by the Convent of Chagga, the Churches of Babiska (401), Dar-Kita (418), Mschabbak, Kokanya and Sedjilla -- all erected in the second half of the

century; that of Khamsir in the region of Djebel Hass and Djebel Shbet, and particularly by the grand group of the Church and Monastery of Kalat Sem'an (S. Simeon Stylites) at the northeast of Antioch, all dated from latter part of the century.

The transition from the 5 th to the 6 th century is recalled by the Church of Baquoza southeast of Antioch; the beginning of the 6 th by the Cathedral of Bosra (completed in 511-512), dedicated to Ss. Sergius, Bacchos and Leontius; by the Church of S. George at Ezra (finished in 515)-- both in the Hauran. To the 6 th century further belong; in Syria west of the Jordan, the Churches of S. Sergius and of S. Stephen at Gaza; in northeast central Syria, the Churches of Zebed, and of Mu"allak at the foot of Djebel Hass, and the particularly successful ones of Tourmanin (recently destroyed) and of Kalb-Louzeh. L Let us also cite as contemporary with the reign of Justinian a Church on Mt. Gerizim southeast of Samaria; at Jerusalem the
36 Church of the Virgin and the Triumphal Gates (propyleums) of the sacred enclosure of the Haram; [1] a Church at Kasr-ibn-Wardan between Aleppo and Homs (564).

Note 1. At the south is the "Double Gate"; at the east the "Beautiful Gate"(Orai pyle), called by the West the "Golden Gate".

As evidence of the secular demands remain a quantity of houses, often nearly intact; parts of cities; baths, and in the n north of central Syria are very numerous tombs, many of which are very important.

The prosperity of the Christian architecture of Syria suffered in the 7 th century from the invasions of the Persians (610-618), [2] and it did not survive the Mohammedan invasion (633-638) [3]

Note 2. The latest inscription is of the year 609.

Note 3. From the middle of the 7 th to the end of the 11 th century nothing was produced. The crusaders found standing only the Church of the Resurrection and the convent of S. Mary at Jerusalem, and the Basilica of Bethlehem.

37 Chapter 2. Natural and Human Conditions. -- Influences. -- Schools. -- Epochs. -- Radiation.

I. Natural and Human Conditions.

Stone abounds in Syria; in the western and northern regions, it is a stratified limestone iy thick beds, easily cut, and t toward Antioch, finely-grained and hardening in the air. The eastern portion of northern Syria (Djebel Hass and Djebel Shoet) and the region of central Syria beyond Jordan afford hard stone, especially basalt. Certainly the north of Syria was n not then deforested as now, and its inhabitants could at great expense, it is true, obtain magnificent timbers in the forests of Lebanon and of Amanus; however it appears that in the course of the 6 th century, wood became more and more scarce. On the other hand, woody materials were wanting beyond Jordan. Let us recall, that among the characteristics of the country, figures the dry heat of the climate and the frequency of earthquakes.

Human conditions found by architecture in Christian Syria w were very favorable. Secular demands were liberally provided for, and further for religious programmes, enthusiasm controlled their execution and conception. The civilization was brilliant; minds were very cultivated, acute and full of energy;[1] scientific knowledge was considerable; technics very developed. It came from an era of great structural activity, and benefited by the experience acquired in the course of the work created by the monumental magnificence of Antioch, Baalbec, Palmyra, Bosra, Djerach, Ammon etc.[2]

Note 1. Remember thot the centre of Hellenistic culture was Antioch.

Note 2. Volume I, pages 437, 447.

II. Influences.

The career of the architecture of Christian Syria was the r
38 resultant of three forces; Hellenism, natiwe originality, and the influence of the Mesopotamian-Persian East.

Hellenism had fascinated the upper classes and the radiation from Antioch, its powerful and charming capital, survived paganism. Yet there was no assimilation, the mass of the people had not been affected; even among the Hellenizing class, the Semetic mind remained entire and the traditions of growth were

prominent. The triumph of Caristianity precepitated a reaction against Egean intrusion, which brooded for a long time, and to which contributed important Arab immigrations. [1] The movement favored the influence of the Mesopotamian-Persian E East, which must be more effective, since Syria was economically dependent on the Sassanian empire, and being allied to the peoples of the region of the Tigris and the Euphrates, it was accessible to their esthetics.

Note 1. This is manifested by a rapid reaction from the G Greek language to the Aramean in Syria. See pages 98, 99.

In brief, the architecture of Caristian Syria takes from H Hellenism what it exhibits in logical construction; from the Mesopotamian-Persian East its taste for vaulted covering as well as the conception of the effect by sculptured details (pages 54, 66, 67); finally from the incient indigeneous basis, certain methods of construction and of decoration (pages 49, 64, 66). There was still an intervention of Byzantine a art, but in minute proportions.

III. Schools. -- Epochs.

The work of Syrian architecture reveals the existence of s several provincial schools and a regular evolution, indicating life and progress.

The coast from Antioch to Gaza and the country west of the Jordan were relatively Hellenizing.

The north portion of the central region, south and east of Antioch, divided between Grecian and oriental tastes, gave an increasing advantage to the latter; its course dates from the 3 rd century, and it attained its climax in the decline of the 6 th. It produced masterpieces (Kalb Louzeh, Kalat Sem'an). There may also be distinguished two regional units, one located in the district of Djebel Riha, the other in that of Djebel Barisha.

39 The plateaus of Djebel Hass and of Djebel Shbet, on the east of the provinces previously mentioned, from the 4 th to the 7 th century were the scene of an inferior architectural production, differentiated from that of northern Syria by practices demanded by the special geological conditions. [1]

Note 1. These districts have nomaterial other than basalt.

For similar reasons, the Hauran forms a fourth province, v

very oriental, [2] and in certain respects the most original; established in the 3 rd century, its formula was not evolved.

Note 2. Because of a strong Arab immigration (see Part II, Sect. I; Arab Architecture before Mohammed; pages 98, 99).

IV. Radiation.

The radiation from the architecture of Christian Syria was
considerable; it impressed enegertically on the one hand Cop-
tic Egypt and especially northern Africa, Byzantium and north-
ern Asia Minor; on the other being the Mohammedan schools of
40 Syria, Egypt, Maghreb, of Asia Minor, of the Seljouks, and t
the Ottoman empire. It further affected western Europe, par-
ticularly Italy on the Adriatic. (Volume III). (20, 3).

Chapter 3. Programmes and their Realizations.

I. Secular Programmes.

Civic Programmes.

The arrangement of Syrian cities is characterized by a method of Hellenistic origin, the furnishing of the streets with porticos, attached to the houses or separate, and of opening a great central avenue bordered by galleries.

Domestic Programmes.

In a general way, domestic programmes were conceived in the oriental fashion. As far as possible, the habitation was isolated from the exterior, opening on a court enclosed by a b blind wall (23,1). In the cities, the lack of space compelled the erection of houses with facades on the street, with b balconies bearing an enclosure, the prototype of the Mohammedan mushrabiyehs.[2] (23,7). (Page 209).

Yet the distribution was not alike in the south and the north. In the Hauran, the court was enclosed on three sides by two-story buildings, the upper being accessible by internal and external stairways. (Volume I, page 485, Fig. 323). The selamlik was formed by a great hall, as high as the house; the harem by the chambers, and if for sleeping, these were furnished with alcoves and small closets arranged in the thickness of the walls. Separated by a corridor, the khan comprised t the kitchen, cellars, stables and cisterns.

In northern Syria, the distribution was different and more monumental; it more fully distinguished the common room from
41 the dwelling; often it gave to the entrance the proportions of a deep portal with benches at the sides, even those of a pavilion with a crooked passage and a porter's lodge (23,1,4, 5,6,8); finally it placed the house lengthwise and divided in the second and ground stories into a series of large rooms a and a wide portico with piers or columns (23,1,2,8). In the country, villas were decorated by a garden, enclosed on the side next the dwelling by a portico of vertical stones connected by horizontal stones, and supporting a trellis. The family tomb frequently rose in the garden.

Funerary Programmes.

According to the native tradition, which was otherwise in
42 conformity to the rocky nature of the soil, Christian Syria

constructed a tomb most frequently by an excavation; sometimes level at the sides; sometimes in the crypt at the end of an excavation with a front arranged as a facade or portico ((24,12); finally sometimes in the depth of the earth, either laterally in a well or at the end of a stepped passage, whose entrance was closed by a heavy slab (24,11), or occasionally sheltered by a structure in the form of a canopy (24,7). In the extrem north of the country, the tomb was often masked by the erection of a massive stele, or rather of a pair of columns or of piers connected by an entablature.(24,8).

Under the open sky, a tomb nearly always consisted of a square chamber, occasionally with a second one above it, in which niches received the coffins (24, 1,2,3,5,6,10); a portico sometimes preceded the facade in which was pierced the doorway (24 4,10). There may be counted a certain number of examples of the realization of the motive of a monumental sarcophagus, raised on a platform or covered by a canopy (24 9,13).

II. Religious Programmes.

The normal plan of a Syrian church was that of a basilica [1] orientated from west to east, and rarely divided in five, but commonly in three aisles, the middle one being wider than the side aisles (25). At the east curved an apse, which was ordinarily flanked by two small apses. [2] West of the Jordan and in the Hauran, it projected from the rear of the edifice [3] (25 1-4); but in the remainder of central Syria, it was the rule [4] for the rear of the church to terminate in rectangular form, the three apses being actually included within a rectangular mass [5] (25, 9, 10,12,19), or that the principal one w was distinguished by two recesses from the little rectangular apses ranging with it [6] (25, 6,7,8). Rarely rectangular and sometimes polygonal [7] (25, 8), it exceptionally took a horseshoe form. [8]

Note 1. See page 27.

Note 2. See page 28.

Note 3. See the Churches of Tafka, Chogga and Suweda.

Note 4. As examples, we cite the Churches of Kalb Louzeh and of Kalat Sem'an.

Note 5. See the Churches of Behio, Hass, Deir Seta and Kherbet Hass.

Note 6. See the Churches of Babiska, Baquoza and Tourmanin.

Note 7. This was a hexagon at Tourmanin.

Note 8. Church of Zebed (511).

43 44 The Church of Bethlehem (25, 11) and an inscription at Bozra, dated in 487, are evidence that in the 4 th and 5 th centuries, Syria made use of the trefoil plan (page 29).

45 In the Hauran, the three aisles were of the same height, and the side aisles were divided into two stories (26, 3); in the remainder of Syria, the height of the central aisle exceeded that of the others, but was but little more than that of the apse (26, 1; 32).

The Church of Kasr-ibn-Wardan (25, 19) presents a Syrian r realization of the central basilica with dome and galleries, familiar to Asia Minor and to Byzantine art. (Pages 73, 145).

The school of northern Syria is characterized by a mode of opening on each side facade one or two doorways preceded by columnar porches, [2] and by a tendency to multiply windows in the wall of the apse and in those of the side aisles (26, 1; 21; 32; 22; 27).

In Syria west of the Jordan, the programme of a great church comprised an "atrium" [3] (25, 13). It was the opposite in central Syria. The school of the north sometimes arranged a portico along one of the longer sides of the edifice. [4] (25, 16). More frequently and especially on the northern borders of its area, this constituted a projection on the entire length of the facade; in plan it was sometimes an open porch (26; 25, 17,21; 34, 3), an enclosed vestibule, either as wide as the church, or reduced laterally by two halls or by two pavilions (25, 18,19,20,23; 34, 4-6); the elevation comprised at mid-height an uncovered terrace or a gallery, that was sometimes flanked by two towers (34, 4,5,6). We recognize there a
46 native motive, realized two thousand years earlier by the "h "hilani" of the Hittite palace.[1] ; in the 9 th century B.C. by the "elam" of the Temple of Solomon; [2] toward the beginning of the Christian period by the front portion of the Temple of Baalsamin at Siah (26, 21); in the 2 nd and 3 rd centuries by Roman edifices, like the "Kabyle" of Omm-es-Zeitoun (34, 1). On the other hand, we discover in it, if not the model, at least the prototype of the facade of the Romanesque and Gothic

churches.[3]

Note 2. See the Churches of Betoura and of Roueiha.

Note 3. See page 27.

Note 4. See the Church of Babisko and the Chapel of Rbe'ah.

Note 1. Volume I, page 152.

Note 2. Volume I, page 167.

Note 3. Volume III.

From the 4 th century, witness the Church of the Resurrection at Jerusalem and the "Great Church" of Antioch; in the 5 th, the evidence of the Church of Wiranshehr (28, 5); at t the transition from the 5 th to the 6 th -- the octagonal Church of S. George at Ezra (28, 2; 31, 7,9); that of Mt. Gerizim are proof that the central and radiating plan was familiar to the religious architecture of Syria. When the conception was monumental, a high octagonal drum, pierced with windows in its uppor part and supported by a series of columns or piers, was placed in the interior of a square (page 30) or c
47 circular nave, from which projected at the end of the orientated axis an apsidal sancturay, flanked or not by little apses (31, 7,9). Sometimes as at Antioch the elevation comprised balconies. A cross-shaped radiation [1] was realized at Kalat Sem'an by opposing in pairs on opposite sides of an octangonal court, of four naves, the eastern being devoted to the same service. (29; 21).

Note 4. In this case an arrangement of the exedras produced in the interior of the junction of the nave to the central dome (28, 1,2; 31, 7)..

48 In conformitory to the obligation laid on the monks to live absolutely in "community", a Syrian monastery does not contain cells, but was divided into several great halls for use or refectory and as dormitories, which abutted against the enclosing walls and received light from a central court. It was not rare for these to have but one story. (29).

Cnapter 4. Construction.

The architects of Cnristian Syria were exferienced, conscientious and skilful constructors, interested in progress, and further well informed concerning Hellenistic and Mesopotamian=Persian experiments.

49 I. Materials.

Conditioned on the geology, their construction was in the greatest measure in stone, and even exclusively so. A combination of bricks and stone is observed only in edifices erected under foreign influences. [1]

Note 1. See the churches of Constantine in western Syria and the Church of Kasr-ibn-Wardan, which evidently depends upon the Hellenistic art of Antioch.

Indeed, Syria always had at command excellent quarrymen and stonecutters. [2] It was not rare, that the ground story of a house was excavated in the rock, and that the second story w was built with the excavated materials. To economize the operations of cutting, blocks of large dimensions were freely quarried. [3] For the same reason, an irregular jointing was p permitted, particularly in basaltic regions, where the rock split into angular blocks. Mortar of lime and of gypsum was used.

Note 2. See those of the Canaanite and Phoenician epochs. (Volume I, pages 161, 169).

Note 3. The piers of the Hospital of Tourmanin are monoliths of square section 14.8 ft. high and 1.97 ft. wide. At K Khanasir, a basalt lintel measures 13.4 ft. long, 2.3 ft. wide and 3.05 ft. deep.

II. Procedures.

The Wall and the Portico.

Frequently in ordinary construction, the materials were employed as they came, and there resulted an apparent polygonal construction. In this case, there was a jointing with mortar and a filling of crevices by stone spalls (30, 3).

Horizontal jointingrarely included the regulation of the c courses and the correspondence of the joints; this did not p prevent it from being very stable and often very beautiful. Always set dry and without cramps, it presented in the north the refinement of connection by projections and recesses. (30, 1,2,4,5).

Let us note as a characteristic peculiarity of Syrian architecture its taste for corbelling, particularly in northern Syria, that liked the column standing on a corbel (32).
50 An opening was freely spanned by a lintel, relieved by an arch, and in case of a window, they liked to hollow out its lower part so as to create the appearance of an arch (30, 8, a, b). But the jointed arch was also employed.

Ordinarily, the arch had no extrados and the voussoirs penetrated more or less deeply into the mass of the walls (30, 7). With a view of facilitating the execution and increasing the stability, it was carried as high as possible by corbelled courses (30, 6). If the opening was small, the arch was sometimes composed of three blocks. The oriental school of northern Syria constructed its arches in the Roman manner by means of a concrete of stones and mortar. Until the 7 th ce-
51 ntury, the normal form was an arc, generally semicircular and very frequently stilted, sometimes raised. Then prevailed t the pointed arch with two centres, [1] doubtless imported from Mesopotamia, and appreciated for the reduction of both the thrust and the load on the centres during construction.

Note 1. In the choir of the Church of the Holy Sepulchre at Jerusalem, completed in 1150, there exists not a single a arch, that is not pointed.

For the realization of the isolated support, the column and the pier competed, one being a monolith, the other being of one block or constructed; the first always dominated in the north and the second in the Hauran.

Except in the north and for small spans, the crowning of a portico was rarely an architrave, to which a curvature sometimes gave the form of an arch. Generally it was an arch, semicircular or stilted, and which in case of a colonnade rested directly on the capital by the mediation of an impost block.[2]

Note 2. See further on page 61 the precautions taken to arrange for the imposts a bearing on the capital.

One of the most characteristic traits of the art of building in Christian Syria, and one most indicating its ascendency a and its powers, is the variety of the methods of covering applied by it and the combination of several frequently made f for the same edifice.

The use of a carpentry roof was possible only in the extreme north of Syria, in the vicinity of the wooded mountains of A Amarus. Everywhere else it was forbidden by the lack of trees, unless in the Maritime cities by reason of the facility of importation, and at Jerusalem, or because of the prestige of the place neither the trouble nor the cost was considered. They were freely arranged in the form of an ovoid shell.[3] Careful to reduce the spans of its trusses, the school of northern Syria arranged for them the support of corbels projecting from the walls.(31, 4,5; 32). Sometimes division walls were placed on great transverse arches, projected above the roof, facilitated the covering and formed an obstacle to the transmission of fire (31, 4).

Note 3. Witness the wooden dome, that the texts inform us was constructed over the Great Church of Antioch in 526; that constructed by the evidently Syrian authors of the Kubbet-es-Sakhra at Jerusalem; (see further page 224), and again that covering the thin walls of the Cathedral of Bosra.

52 53 54 The geological nature of the country invited a covering of stone. Actually, Syrian construction applied the system of the ceiling of slabs supported by corbelling or borne on arches, that was known to the Parthian school (page 16), and which had been utilized in the Roman epoch.[2] (31, 1); that of the vault jointed in tunnel form, recommended by Roman experience; that of tunnel vaults on partitions, familiar to Sassanian Persia.[3] (31, 2). The realization of a shell of brickwork was exceptional, confined to the frontiers of the desert,[4] and was doubtless determined by a Mesopotamian or Byzantine influence.

Note 2. Volume I, pages 486, 487.

Note 3. See the substructions of the "Haram" at Jerusalem. For the Persian application, see page 166

Note 4. See the ruins of Kasr-ibn-Wardan.

The solution of the problem of the covering of a square interior by the expedient of a calotte seems to have tempted t the architects of mediaeval Syria; they attempted the cloister vault, the shell in jointed masonry, that in small stones connected by mortar, that of bricks, a dome on a drum, and f finally the cross vault.

Only one example of the first method is known, offered by the Pretorium of Mousmiye.(Volume I, page 493). The second may be observed in the Roman ruins of Djerach (Gerasa) (31, 10,11) and at the gates of the Haram at Jerusalem, which date from the reign of Justinian (31, 12,13); indeed the covering of the apse is achieved by a quarter sphere, characterized by false joints and a progressive diminution of the heights of the blocks in proportion as they approach the summit (22; 32). The pagan Chapel of Omm-es-Zeitoun (282 A.D.) (34, 1), and t the Church of S. George at Ezra (31, 7) are still covered by domes in concrete; that of the former is hemispherical and r rests directly on the walls of the nave; that of the second is ovoid in the Mesopotamian-Persian fashion, and is raised on a drum pierced by windows. It was the same for the dome, constructed in bricks over the Church of Kasr-ion-Wardan.

The difficulty of joining a calotte of circular plan to a square or octagonal drum was solved in various ways; sometim-
es -- witness S. George of Ezra -- the angles were cut off by
ceiling slabs, repeating the operation until the polygon pro-
duced had enough sides to afford a support for the base of t
55 the shell (31, 6,7); sometimes the cut off angle was obtained
56 by the artifice of an angle trumpet in the form of a niche (
(31, 7), very much employed at the beginning of the Mohammed-
an epoch; sometimes was preferred the artifice of the penden-
tive, witness the gates of the Haram at Jerusalem; translati-
ng into stone an Asian formula conceived for bricks, spheric-
al triangles were laid up with horizontal beds, which system
is peculiar to Syria (31, 10-13).

As for the cross vault, which became the usual mode of covering after the Mohammedan conquest, it was executed in rubble jointed with mortar, with a corbelling of the courses at the joinings of the panels. [1] (31, 3).

The contradiction of a method of vaulted coverings on centerings and of a scarcity of wood, sometimes extreme, was certainly reduced by that Syrian ingenuity, of which certain actual procedures give an idea. "In our time in Syria", states M. Choisy, "the centering of a vault consists of horizontal poles fastened by the ends to forked verticals. The whole is covered by bundles of sticks and a coating of earth reducing

well or badly the irregularities of the surface. Thus is obtained an economical support, though flexible and that can be deformed. The mortar joints crack by the deflections, if they have set before the entire completion of the work. This danger is guarded against by finishing the vault in a single day; as many masons assemble as permitted by the extent of t the yard; they commence work before day and continued for a part of the night, if necessary. In this way the movements of the centering only affect the masonry while still fresh' this masonry changes form without cracking; and when this commences to harden, the vault is closed at the vertex and no l longer needs these auxiliary supports".

The Syrian roof was a terrace in the Hauran (31, 1); in the northern portion of the country was a roof in two slopes or a shed roof covered by tiles, according to whether the nave was isolated or abutted against a higher aisle (31, 4,5; 32); Sometimes it was realized in stone by means of slabs cut in a manner to cover each joint.

Chapter 5. The Effect.

With regard to the effect, the architecture of Christian S Syria appears as remarkable as for the construction. An analysis of its works leads to four statements; it was very much preoccupied with the appearance of the exterior, almost as m much as that of the interior -- which distinguishes it from its Asian relationship, and allies it to the Egean and European family; in the Hauran and particularly in the eastern portion of the northern region, it was clearly restricted by the hardness of the basaltic materialr; its conception of the beautiful was thoroughly architectural; subjected to the influence of Mesopotamian-Persian Asia and to the action of Hellenism, which in the north radiated strongly from Antioch, but likewise orientated by the energetic impulses of the native genius, it commenced by placing its mark on the classical formula, and then it manifested its individuality by inventions.

It never sought to impress by material grandeur; programmes as careful as those of the Churches of Tourmanin and Kalb Louzeh did not comprise dimensions exceeding 114.8 to 121.4 ft. for the length or 52.5 to 59.1 ft. for the width.

On the other hand, it possessed in a very high degree both the taste and the feeling for the effects of harmonic order and for those of picturesque character in the monumental harmony.

I. Effects of Harmonic Order.

It It loved and succeeded in regular and symmetrical arrangements inscribable within rectangular proportions, and outlines were commonly demanded from arithmetical combinations a and geometrical constructions. Thus the dimensions, figured in feet, were whole numbers, preferably chosen for mystical reasons of pagan or Christian conception -- among those multiples of 3, 4, 5, 7 and 12, [1] or fractions of a number exactly divisible by one of these. The ratios were very definite and simple -- frequently that of 2 to 1; finally, they liked to base the determination of positions and directions on the "Egyptian" triangle.(33). [2]

Note 1. See page 20. At S. George of Ezra, all the sides are multiples of 3, or one-third of a number divisible by 3. (60; 33; -- 24; 27; 12; 15; 18; 11).

Note 2. See Tourmanin and Kalb Louzeh.

II. Effects of Monumental Relief.

No trait better characterizes and recommends more the productions of Syrian architecture, than the character, both picturesque and architectural, of their general form and their secondary relief.

58 The monument was always enhanced in effect by its elevation on a base of greater or lesser height with vertical sides (34, 5,6; 24; 22; 27), and in the north of central Syria, the eyes and the mind were impressed by the qualities of the relief, varied and accented on the one hand, on the other being harmoniously balanced and logically harmonized with the internal arrangements. Such were especially the appearance, both so happy and so novel, that the churches derived from the projection of the apse and the little apses, the latter being smaller than the former aud of different shape (22; 27); from the projection of a wide flight of steps from the facade and sometimes of lateral porches (25, 14,22; 34, 5); from the height of the middle aisle above the side aisles and the apse; part-
59 icularly in certain cases (34, 3-6) from the arrangement of
60 front porticos, which we have previously explained, [1] (page 45), with the shady space of its wide vestibule indicating t the principal aisle, the rise of its angle towers before the side aisles, and at the mid-height of the elevation, the terrace, sometimes with a gallery above it.

These grand effects were supported by the energetic assistance of a secondary relief, varied and accented. Then were the numerous splayed windows and doorways, and frequently the opening was repeated at reduced size above the lintel (35, 2, 7); the recesses of the niches already liked in the Roman epoch (35, 1); the scale of solids and voids developed by real or imitative porticos (34, 4,5; 35, 5; 27); the strong projection of mouldings continued horizontally as limits of zones; (34, 3-6; 35, 1,5; 22; 27), or according to a very original
61 mode, native to Syria, bordering the openings like a band (35, 1; 22); the great prominence of tablets or of caps above the rectangular openings (35, 3,7); the wide projection of the main cornices, supported by a closely spaced row of either c corbels or of small columns, or of these in alternation, of

columns standing sometimes on corbels, sometimes on the tops of supports resting on the substructure (35, 1,3; 27). The last arrangement was very happy and very characteristic of S Syrian apses, announcing six centuries in advance one of the typical peculiarities of Romanesque architecture, and recalling that of niches and of arcades pointed out in our analysis of the art of building in Sassanian Persia. (Page 13).

III. Effect by Reliefs of Details.

The effect by details in relief are very sympathetic in the Syrian school. But when it concerned a useful member, the f form was in large measure rational and expressive in its function.

In that respect, the modeling of the isolated support is v very significant. If a pier, it sometimes presented the organic form of a bundle of stems, each of which had its separate load (36, 5). If a column, its shape was determined by i its purposes. The shaft was sometimes stumpy. The base was profiled in Ionic taste and was well extended. Particularly the capital was appropriate to its work of bearing one end of the architrave or of the imposts of a pair of arches; frequently -- the arrangement is very characteristic of the school -- its mass throws out two lateral consoles (36, 2); sometimes -- the expedient is notable in the 6 th century, [2] and it announces the end of the pagan epoch [3] -- the necessary enlargement was obtained by the superposition of an impost block, cut in the form of a truncated pyramid. [4] (36, 4-6).

Note 2. See Tourmanin.

Note 3. See a capital of the Temple of Baalsamin at Sieh.

Note 4. The expedient of the impost block is eminently characteristic of Byzantine architecture. Page 154.

Its properly ornamental relief was no less characteristic of Syrian esthetics. Subordinated to the satisfaction of structural requirements, it was rather heavy.

63 Frequently the appearance realized by it was derived from Ionic or Corinthian, that differed from the originals by simplifications, by alterations, and even by combinations. The most remarkable peculiarities, in case of the adoption of the Ionic fashion, was the placing of a group of volutes above a great hemispherical cushion (36, 3), and when a Corinthian f

formula was chosen, a flat, lean and dry modeling, comprising
breaks rather than curves (36, 7); the development of a wrou-
ght pad at the base of the bell, the substitution of a zone
of scrolls for the second row of foliage; and the replacing
of the Greco-Roman acanthus by a more slender variety, piqua-
64 nt and not toothed (36, 7); the association of the motive of
the acanthus with another, borrowed from the desert flora, t
that of a lanceolate and rigid leaf, whose pointed end is ab-
ruptly recwrved like a crocket (36, 7,9,14).

A second category might be formed with some original compo-
sitions of a plant or geometrical form; a series of flat lea-
ves, erect above a collar of fluted sepals and with round en-
ds, in the taste of the motive exhibited by the Egyptian palm
forms and by the Hellenic basket form [1] (36, 1); a truncated
cone enclosed by four leaves lying beneath the angles of the
abacus (36, 12); a block with concave sections (36, 11); a c
calyx grooved by oblique flutes (36, 13); an ovoid volume wi-
th reticulated surface (36, 4); the appearance of a Corinthi-
an bouquet springing from a hemispherical netted bell (36, 10).

Note 1. Volume I, pages 97, 364.

A notable trait of the relief of the Syrian capital was a
mode of inclining the foliage of the sides, as if affected by
a gyratory current of air (36, 7,9).

The profiles of Syrian mouldings (37) are subject to some
ideas of logical construction, some being from the native tr-
adition and the others from Hellenic inspiration; let us note
as characteristic forms a great roll, already appreciated by
Phoenician art; [2] a sort of cyma, that in the course of its
career the school made more and more projecting at top and s
swelled at the bottom, and which combines both a Hellenistic=
Roman form and the Egyptian cavetto; [3] a formation of the ma-
in cornices, nothing else than an excellent arrangement for
the rejection of rain water (37, 1).

Note 2. Volume I. 110, 1.

Note 3. Volume I. Pages 509, 82.

IV. Effects of Ornamentation.

As much as any other oriental architecture, that of Christ-
ian Syria loved ornamentation.

When so permitted, it sought for the interior the effects

the costly and gleaming materials, that it required from mar-
65 ble facings, from pavements and coverings in mosaics, [1] and from metal overlays. [2]

Note 1. It employed mosaics, even on the exterior; witness the Basilica of Bethlehem and the facades of several churches at Jerusalem represented on a topographical mosaic discovered at Madaba.

Note 2. Note the application to the Church of Antioch of the adjective "golden", and contemporary descriptions of the Church of S. Sergius at Gaza and of the Sanctuary of S. Simeon Stylites (Kalat Sem'an).

At least it utilized stucco, which was tinted or covered by
66 ornamental or significant frescos, the latter devoted to edifying illustrations of christian dogmas and display.

In the Hauran and in the east of northern Syria, where it was opposed by the hardness of a basaltic material, its favor fell to relief decoration, determined by the practice of construction in stone and by that lucid knowledge of the loss of the art of building, of which so many proofs have been collected, and also doubtless by the happy influence of Hellenic e esthetics.

As friezes, cornices, bands, enclosures of openings, it developed rich, but not refined compositions, with conventional treatment and symmetrical arrangement (38; 40).

Limited to ornamental themes, the repertory of Syrian sculptors drew from the fourfold sources of Hellenistic models, f from Mesopotamian-Persian types, Hellenistic models, geometrical combinations, and from Semetic, Mesopotamian-Persian and christian symbolism. On the one hand, the acanthus and the scroll; on the other, the triangle, zigzag, disk and rosette; further, guilloches, interlacings, ropes, knots and complex
67 network, that show the Mohammedan arabesques and polygons; (page 250); finally, vine branches, grapes, pomegranates, a vase between peacocks or doves, drinking life therefrom, and from which often rises vine branches (tree of life); the cross, the monogram of Christ, a winged disk stamped with the same signs (39).

The style of Syrian sculpture is very characteristic, the prototype of that adopted by the Byzantine school, otherwise

being thoroughly Asian. Confined to very low relief, even to sinkings and to engraving, it was detailed with a firm chisel, with the freedom and dryness of goldsmith's work, toothed and fluted foliage, lean and scarcely projecting, when not flush with the stone. Yet it was wisely detached from the ground by clean and deep cutting, an efficient producer of hard outlines and strong shadows (38; 40). In brief, the Syrian conception of relief ornamentation tended to realize a stone embroidery, equivalent in effect to the mural tapestry always loved by the East.

Section II. Christian Architecture in Asia M Minor outside the Egean Provinces.

Chapter 1. Requirements. -- Conditions.

I. Requirements. — Monumental Chronology and Topography. The introduction of Christianity into the central [1] and the southern [2] provinces of Asia Minor produced architectural demands there far superior to those of the Hittite and Hellenistic civilizations. [3] These countries adopted the new religion with enthusiasm; particularly Anatolia, which distinguished itself by its ardor in building sanctuaries, as much as by i its love for theological speculations and its fertility in d doctors of the Church. [4] Religious architecture continued very actively there until the time of the invasion of the Seldjouk Turks in the decline of the 11 th century (1072). Unfortunately, an accurate appreciation of the results is not yet possible, because the inventory of the monuments is far from being complete, and their chronology is very uncertain. [5]

Note 1. Cappadocia, Lycaonia and Galatia.

Note 2. Pisidia, Pamphylia, Lycia, Isauria and Cilicia.

Note 3. Volume I, pages 150, 253 - 256.

Note 4. In Cappadocia and Lycaonia, certain regions are l literally encumbered by churches, chapels, oratories and monasteries.

Note 5. The relevation of the singular historical importaance of the Christian architecture of Asia Minor is due to M. Strzygowski. (See his work:- Kleinasien, ein Neuland der Kunstgeschichte. 1903).

A first group comprises: -- in Cappadocia, [6] the Churches of Nazianzos, of Nyssa [1] (14 th century)' of Sivri-Hissar (5 th century), of Tchanli-Kilisse (8 th century ?), of Tchurken, of the Forty Martyrs near Skupi, of Utschayak, and the numerous rock-cut sanctuaries, particularly in the canton of Gereme (at Doghali-Kilisse); in Lycaonia, the Churches of Dikeli Tasch (4-5 th centuries), of Ala-Klisse near Konieh, those of the Kara Dagh (Binbirkilisse --"the 1001 churches", Madenshehr, Daouleh and Mahaletch), and the Church of Firsendyn south of Karaman; in Galatia, the Church of Jürme, S. Clement of Ancyra (9st half of 8 th century); on the borders of Armenia, the Churches of Trebizond, erected after the installation of Com-

Comnene in the city (1204) -- the Panagia Krysokephalos, Hagia Sophia and Sa Eugenios. let us further note at the extreme northeast of the peninsula the Church of Koimesis at Nicea. (8 - 9 th centuries).

Note 6. Cappadocia was a nursery of "doctors of the Church". See Gregory of Nazianzen, Gregory of Nyssa, Basil of Seseraea.

Note 1. See the description of the first by Gregory of Nazianzen in the panegyric of his father, and the curious project of a martyr's monument for his native city, communicated by Gregory of Nyssa to his friend Amphilochios, bishop of Iconium.(Migne, Patrologie Gr. XXXV, 103).

In the southern portion may be cited:- in Pisidia, the C Churches of Sagalossos (4 th century); in Pamphylia, those of Perge (4 th century) and of Adalia (Mosque of Djoumanaum-djoumi) (5 - 7 th centuries); in Lycia, those of Alaidjor Jaila, of Dere Ahzy (Kassaba) (7 th century) and of S. Nicolas at Myra (7 th century); in Isauria, those of Isaura, of Derbe, of Kodscha Kalessi (4 - 5 th centuries); in Cilicia, those of Hierapolis Kastabala (4 th century), of Komideli (Konytelideis) and of Korgnos (Korykos; 4 - 5 th centuries).

II. Conditions. -- Influences. -- Radiations.

The orientation of the Christian architecture of Asia Minor was determined by native traditions, neither encroached on by Hellenistic expansion nor Roman action; by the geological condition of a soil rich in stone materials; finally by a geographical conformation, that facilitated invasions from Mesopotamia, Persia and Syria.

Yet an extreme diversity of types and of methods, and the existence of numerous regional varieties attest a large proportion of originality. Considering the antiquity of the monuments, the peculiarities of plan and of construction,that we shall give, present a historical interest of the first order.

There are strong reasons for believing, that the Christian architecture of Asia Minor energetically influenced the development of the Byzantine (page 139) school,and contributed to the progress of Romanesque art. - (See Volume III).

Chapter 2. Programmes and their Realizations.

Christian Asia Minor realized four kinds of religious programmes; those of a normal basilica, of a semi-central basilica, of a central church and of a radiating sanctuary.

The first (42) generally comprised a division into three a aisles, the middle one being wider and terminated by an apse. This was pierced by windows, as well as the lateral facades. Several examples exist with two aisles and having a part of a second side aisle, whose purpose was doubtless funerary. There was no atrium,; but most of the plans arrange a vestibule in the Syrian [1] and Hittite [2] fashion (42, 6-10). The opening of doorways in the longer sides was normal. Galleries were rare, accessible by stairways placed at each end of the porch, which therefore projected from the general outline of the edifice. (42, 7-10). [3]

Note 1. See page 45.

Note 2. See Volume I, page 153.

Note 3. See the Churches of Diner, of Jurme, No. 2 at Binbirkilisse.

The second type [4], perfected at Constantinople by the labors of two masters from Asia Minor [5], is distinguished by an enlargement of the portion reserved for the clergy by the annexation of the first bay of the nave to the apse (43; 45, 5,6). The reduction of the space for the faithful was sometimes compensated by the arrangement of galleries (45, 5).

Note 4. See the Churches of Kadsche Kalessi, of S. Nicolas at Myra, of S. Clement at Ancyra and of Koimesis at Nicea. Also S. Sophia at Salonica (page 148).

Note 5. See S. Sophia, work of Anthemios and of Isidoros, the first originally from Tralles and the second from Miletus. (Page 139).

The adoption of a mode of covering by a dome included the arrangement of a square enclosure in the vicinity of the nave toward the sanctuary (43; 45, 5,6).

This is formed by four arches in churches designed according to the third formula (44, 8-15). [1]

Note 1. See the Churches of Binbirkillille (43, 11), one of those of Konytelideis (113, 1,3); those of Sivri-Hissar, of the Forty Martyrs near Skupi, of Itamush, of Tchouli Kilisse, of Trebizond etc.

Sometimes it was a rotunda (43, 1);[2] sometimes . rotunda or an octagon flanked by an apse (43, 2); more frequently for s symbolism, the plan was cross-shaped, either with four arms projecting from a central enclosure (43, 5,7), or two aisles crossed (43, 6,8), [6] or finally the arrangement of an edifice on a square plan comprised two aisles at right angles. [7] (43, 11,12). The programme of an octagon was sometimes complicated by a side aisle supporting galleries. [8]

Note 2. See a Church at Hierapolis.

Note 3. See at Derbe and Isaura.

Note 4. See page 30.

Note 5. See Church of Nyassa and octagonal No. 8 at Binbirkilisse.

Note 6. See several Churches at Binbirkilisse. The favor enjoyed by this type is revealed by examples presented by the rock-cut oratories of Anatolia.

Note 7. See the Baptistery of Aladscha Kisle, the Churches of Ala Klisse, of Tchanle Klisse and of Firsandyn.

Note 8. See the Church of Nazianzen.

Chapter 3. Construction.

I. Materials.

Where nature favored this, the Christian architecture of A Asia Minor was freely rock-cut; according to the locality, an artificial grotto was excavated, or an isolated rock was hollowed out; sometimes a work of sculpture produced the external appearance of a constructed monument (43, 10,12; 45, 3).

Cut stone and rubble were of ordinary materials; bricks were only employed for lack of stone materials, [1] sometimes as a contrast for decorative purposes. In Lycia, doubtless determined by the influence of the Hellenistic cities of the western coast, is observed masonry with alternate courses of rubble and of tiles, with vaults of burned bricks. [1]

Note 1. S. Gregory of Nyssa expressly says so. Yet his l letter informs us that bricks were appreciated on account of the possibility thereby afforded for vaulting without centres. Besides the edifice referred to in that document, we can cite only the Church of S. Clement at Ancyra and that of Utschayak.

Note 1. See Church of Dere Ahzy.

II. Methods.

Cut stone masonry was generally of good quality, sometimes being even refined and bold (45, 3,4). [3] Jointing with mortar wes common; but they likewise built with dry joints, particularly in the southern region, where the antique tradition survived.

Note 2. S. Gregory of Nazianzen notes that the joints of the edifice built by his father did not exceed the thickness of a hair.

Note 3. Note that the method used by the author of the octagon No. 8 of Binbirkilisse, of opening windows in the projecting angles of the elevation (45, 3,4).

The buttress was in current use.

An opening was sometimes constructed with a lintel, sometimes with a relieved lintel, and sometimes with an arch (46).

The construction of the arch comprised an extrados and the raising of the springings as high as possible. Sometimes the number of voussoirs was reduced to the minimum. The curve f formed a semicircle, which was sometimes stilted.(45, 1). [4]

Note 4. The base of the stilted semicircular arch forms o

one of the characteristics of the Christian architecture of central Asia Minor. (Note the adoption of the form for the p profiles of tunnel vaults and the plan of the apse), at the same time being a certain indication of its submission to oriental influences. The fact that the form is related to the masonry of bricks or of concrete (see Sassanian Architecture, page 12), and that the construction of Asia Minor is in cut stone, indicates a case of the phenomenon of a transposition of the structural order into a decorative order.

The isolated support ratner was a pier than a column; the portico was an arcade.

The Covering.

The covering by a stone ceiling was rare, being confined to the southern region, exposed to radiation from Syria. [5] The tunnel vault and the dome were common, sometimes being associated in the same edifice.

Note 5. Note above the side aisles of the Church of Kodscho Kalessi, an application of the Syrian system of ceilings of stone slabs on transverse arches. (Page 16).

The former, whose profile was often a stilted arch, was sometimes strengthened by transverse arches (45, 2).

The second was circular or polygonal in plan; in elevation, hemispherical, pyramidal, conical or conoidal. Sometimes for purposes of lighting, it was elevated on a drum pierced with windows and placed on a square [1] or polygonal plan (45, 5). [2] When the drum was not circular, its connection with the calotte was made, sometimes by the expedient of corbelled slabs, producing a cut-off angle, [3] sometimes by that of an angle trumpet, [4] occasionally by that of a pendentive, [5] and even by a combination of two modes. [6] As an artifice for consolidation, we may cite an abutting by longitudinal tunnel vaults. [7] or by parts of the structure (43; 44, 8-15), [8] as well as an extension of the base of the dome into a mass, from which externally results the appearance of a drum (45, 6). [9]

Note 1. See Church of Kodscho Kalessi.

Note 2. See Church of Naziansen.

Note 3. See Church No. 9 at Binbirkilisse and an edifice at Mahaletch.

Note 4. See Church of Kodscho Kalessi.

Note 5. See Churches of Dere Ahzy and of S. Nicolas at Myra.

Note 6. See S. Clement at Ancyra.

Note 7. See S. Clement at Ancyra.

Note 8. See S. Nicolas at Myra.

Note 9. See S. Clement at Ancyra.

Chapter 4. The Effect.

From the point of view of the effect, the architecture of Asia Minor appears differently, according to whether one views the southern slope of the peninsula or the central provinces; in the first case being more luxuriousness and more Hellenized; in the second more sober in ornamentation and guided by a vision of the constructors and tending to innovations. In both parts is observed a Syrian influence, which competes in Anatolia with the persistence of the native tradition and the radiation from Mesopotamian Asia.

I. Effects of Monumental Relief.

We note -- as very interesting in themselves and by the tendencies manifested by them -- certain refinements in general and secondary monumental reliefs in the Syrian-oriental taste.

Thus the rear mass of the church is generally accented by a strong projection of the apse, curved in semicircular or very frequently in horseshoe form (42, 2); always in the southern region, more dependent on Syria, the apse was attached to a polygonal plan [1] (42, 3), rarely being included within the o body of the edifice (42, 1,4). [2]

Note 1. See the Churches of Kasteli, Hierapolis, Sagalossos, Dere Ahzy, and S. Nicolas at Ancyra.

Note 2. See the Church of Kodscha Kalessi; those of Konykos and of Kanytelideis.

On the other hand, the facades were animated by a multiplication of doors and windows -- often according with the internal divisions into three unequal aisles (46); by a frequently used system of twin or multiple openings (46, 1,2,4,6); by t the recesses of niches (46, 4); by the projection of porches on consoles (46, 2); by the projection of a substructure, and by the relief of pilasters at the angles and on the facades [1] (46, 5), of engaged columns, [2], of cornices, and in Anatolia, of repeated bands (46, 1,6); [1] by the flat or hollowed arches, simple or with reveals (46, 3,5). [2]

Note 1. See the Church of Forty Martyrs near Skupi and the Church No. 43 in Binbirkilisse.

Note 2. See Church of Tchanli-Kilisse.

Note 1. This multiplication of monumental mouldings, as m much as their profiles, is very characteristic of the Anatolian architecture of Asia Minor.

Note 2. See Church of Tchanli-Killise.

The Christian school of Asia Minor is recommended by a relatively developed feeling for effect by relief of details; w witness the profiles of Anatolian mouldings, simple, yet producing contrasts of light and shade (47); as further proof, the logical modeling of the pier.

That is crowned by an impost and is sometimes a prism with rectangular section placed transversely to the main axis of the aisle, flanked by an engaged column on each narrow side (48, 8-11,14); [3] sometimes being a body membered in accordance with the imposts of the arches to be sustained, and which it receives in picturesque fashion on a detached column (48, 6). [4] As for the columns, they are generally heavy; in the southern regions, they are commonly covered by a degenerated Corinthian capital or a composite with flat scrolls; in Anatolia their heads are generally massive imposts (48, 1-4).

Note 3. This relief is eminently characteristic of the architecture of central Asia Minor; it is also found on the mullions of twin windows.

Note 4. See Church of Kodscha Kalessi.

II. Effects of Ornamentation.

As for the effect of the sculptured ornamentation, the architecture of southern Asia Minor differs from that of the central regions in the twofold matters of proportion and of realization. The first of these is rather singular, and it is c conceived in the Hellenistic-Syrian taste; it is particularly applied to the enclosures of doorways. The second sacrifices very little to elegance, and its decorative repertory comprises little more than geometrical forms of quite rude conception and execution, and that are incontestably crude (49). [5] The two schools freely employ a motive already dear to pagan Asia Minor, a fluting imitating a rigid leaf with rounded tip. (49, 2).

Note 5. See the motives represented in our drawing (49) w with the forms dear to Phrygian and Paphlagonian Asia Minor in the prehellenic epoch. (Volume I, page 218).

The decoration was essentially in color; the stucco formed the external surface of the best constructed walls, and commonly served as a support for paintings, very frequently for

significant frescos. [1] Facings of marble and mosaics were rather rare. [2]

Note 1. See the numerous and important frescos, that still cover the walls of the rock-cut sanctuaries of Anatolia.

Note 2. See the Koimesis at Nicea.

Section III. Armenian Architecture.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Conditions. -- Influences. -- Radiation.

I. Requirements. -- Monumental Chronology and Topography.

Evangelized in the last quarter of the 3 rd century by S. Gregory the Enlightener, the peoples of the mountainous regions bounded by the Black Sea, Anatolia, upper Mesopotamia, t the Caspian Sea and the Caucasus, otherwise termed Armenia a and Georgia, as a result required the services of religious architecture. Some ruins at Garni in the region of Ervan retain the memory of an important structure of king Tiridates at the beginning of the 4 th century.

But from the beginning of the 5 th century, the Christians or Armenia were exposed to the persecution directed against them by the Persians, and necessarily the demand felt its effects. From that epoch dates, if not the elevation restored at the beginning of the 7 th century, at least the plan of t the "Patriarchal" Church placed in the middle of the Monastery of Etchmiazdin (now Valarsapat).

The 7 th century was an epoch of structural activity, particularly in the pontificates of the patriarchs Komitas (from 618) and of Narses III(640-661). The first rebuilt the Cathedr.l of Etchmiazdin, erected at the same place the Churches of S. Ripsimus (618) and of S. Gaian (628-640). The second, named the "builder", in particular built near Etchmiazdin a Church of S. Gregory the Enlightener for the preservation of the relics of the apostles of the country, and which forms an important document for the history of Armenian architecture.

To the beginning of the 8 th century is attributed the construction of the Church of Usunlar (718-728), with which is doubtless contemporaneous that of Dighour.

Under the dynasty of the Bagratides (859-1080), Armenia passed through a period of advance and prosperity, particularly in the last two-thirds of the 10 th century,[1] and in the beginning of the 11 th. From the first half of the 10 th date the Church of the Monartery of Aktamar on the shore of Lake Van, and that of Pitzounda,[2] on the coast of the Black Sea; from the second, the Church of Moswi and that of Holy Cross at Akhpat (977-991). The production of the first half of the

11 th was important; the Church of Koutais (1003), ruined by the Turks in 1691; edifices at Ani, the capital of the kingdom, sacked by Alp Arslan in 1064 -- Cathedral (1010), Chapel of S. Gregory, Chapel of the Redeemer (1041); Monastery of M Marmashen, north of Adrainopol; churches of Soundjerli (1033-1044), of Nikortsminda, under the reign of Bagrat IV (1027-1072). To the third quarter of the century belongs the Church of Samthavis; to its decline, that of the Monastery of Ghelat.

Note 1. Reigns of Ashot III, of Sembat II and of Gagik I, who were princely builders.

Note 2. At least for the plan.

Then the production diminished; churches of Ertatchminda, of Ikorta (12 th century); porch-mausoleum of Church of Holy Cross at Akhpat (1183); Monastery of Kosha Vank near Ani (end of 12 th and beginning of 13 th century); Church of S. Gregory at Ani (1215).

In 1222 raged the Mongol invasion, and the architectural w works of Armenia were then very little; upper Georgia was less attacked; Monastery of Safar above akhalsykh, with a Church of S. Saba (1306-1334).

The 17 th century was marked by numerous additions of porches, that disfigured many ancient churches.

II. Conditions. -- Influences. -- Radiation.

A region of high mountains and exposed to rainy winds from the Black Sea, Armenia opposed to the art of building the severity of a variable and damp climate with an indifferent civilization. On the other hand, it was possessed of two favorable conditions; great facilities for obtaining wood and very good stone materials; an intelligent and active people.

By its religious dependence on Asia Minor [1] and on southern Syria, [2] its natural exposure to invasion from Anatolia, Mesopotamia and Persia, finally by its location, which made it a strategic position incessantly disputed by the Sassanian a and Byzantine empires, it was fated for its architecture to be affected by competing influences, on the one hand from the arts of Asia Minor, Syria and Byzantium, and on the other from the Mesopotamian-Persian, Sassanian and Mohammedan schools.

Note 1. Norses the Great, Catholikos from 340 to 374, was a disciple of S. Basil of Cesarea.

Note 2. Mediaeval Armenia possesses important Syrian colonies.

Until about the 10 th century, the former dominated; then the latter prevailed. Hence the necessity for distinguishing two epochs in the history of Armenian architecture, one preceding and the other following the 10 th century.

Yet the Armenian style radiated in several directions and affected very distant countries, its expression being favored by the prestige of its monasteries and by the emigration of a part of the inhabitants of Ani, north of the Caspian Sea, into the Crimea, Galicia, Moldavia and Poland, [1] after the taking of their city by the Seldjouks (1064).

Note 1. These Armenian colonies have maintained themselves until our time.

It certainly furnished Seldjouk Anatolia with formulas of construction; [3] Russia with programmes and also doubtless with masters; [4] Servia and Moldavia-Wallachia with models of decoration, [5] perhaps it was not foreign to the evolution of the Byzantine school after the 10 th century. [1] Finally, without its being possible to derive fixed conclusions from this, it is a fact, that the general appearance and various peculiarities of the Armenian churches give them a striking resemblance to the more recent edifices of Carlovingian and Romanesque Europe. [2].

Note 2. The porch is a later addition (51).

Note 3. See pages 207, 225.

Note 4. See pages 260, 262, 263, 266, 267, 269.

Note 5. See pages 273, 276, 282.

Note 1. See page 140.

Note 2. See Volume III.

Chapter 2. Programmes and their Realizations.

Armenian religious programmes are characterized by a mode of central and radiating composition.

It appears in the plan of the most ancient church known, that of Etchmiazin (52, 1); a nave with a central bay defined by four arches supporting a dome, with four projecting arms terminated by apses; these are semicircular in the interior and pentagonal externally; the eastern one is utilized for t the rites and is flanked by the little apses required in the East. [3]

Note 3. See the analogous composition of the Church of Ateni and of Martvili (11 th-12 th centuries).

From the same principle proceeds the ordinary arrangement of the funerary commemmorative churches; [4] that of S. Gregory the Enlightener near Etchmiazin shows in the interior of a r rotunda a combination of a square on four piers and of exedras on colonnades, from which results a quatrefoil outline. (52, 2).

Note 4. See Chapel of S. Ripsime at Etchmiazin.

Even in the oblong churches based on the basilican type with three apses, this tendency is evident in the entire extent of the country and in all times. Indeed in consequence of t the arrangement of a part of the nave in an elevated form with arches opened toward the side aisles as well as toward the sanctuary and the entrance, all are more or less clearly central and radiating; sometimes -- as at Dighour, Usunlar and Ani (52, 4,8,6) -- since the nave comprises but three bays, there is equalized distribution lengthwise and transversely; or again -- for example at Koutais -- the projection of the two great lateral apses placed on the axis of the square realizes a cross-shaped form (52, 7); sometimes as at Pitzounda, an elongation of the front portion of the nawe is opposed to the manifestation of the method.

The Armenian programme of the church is again marked by some peculiarities; absence of an atrium and almost always of the narthex; annexation of a sanctuary to the apse; opening of entrances and often with projecting porches on the longer sides -- two practices familiar to southern Syria; [1] hollowing out small external apses, symmetrical with the internal

ones, in the T-shaped masses at the rear end of the edifice ;[2] the development of a peristyle on the front and side facades of the monument. [3]

Note 1. See page 45.

Note 2. See Churches at Dighour and Usunlar.

Note 3. See Usunlar.

87) Frequently monumental, the Armenian tomb consisted of a rotunda, an octagon, or again of an area with numerous foils, that was sometimes preceded by a porch.

Chapter 3. Construction.

Armenian architecture is impressive by the quality of its construction.

That was substantially in stone. [1] The jointing was careful and regular, accurately leveled and well pointed.

Note 1. Masonry of mixed bricks and stones was exceptional, as shown by the Church of Koutais (alternating courses and b brick enclosures around the openings).

For covering an opening was sometimes employed a lintel relieved by an arch; but commonly an arch was turned, whose curve was semicircular or stilted in the fashion of Asia Minor.

The pier was preferred to the column, and a portico was composed of arcades. From the 10 th century -- the innovation signifies a revival of Mesopotamian-Persian influence -- those of great span were pointed. (Page 208).

Covering.

The Armenian school realized the covering by means of vaults, very skilfully constructed as tunnel vaults or domes. T The former were strengthened by transverse arches, and were pointed after the 10 th century. The construction of the latter, supported by a cylindrical or polygonal drum, was by superposed annular courses, slightly raised at the outside; their profile was conical in order to avoid complications in c cutting and the erection of centering, as required by the closing of a spheroidal dome (54, 1; 51; 53). The junction of the drum with the supporting square was executed by the expedient of the pendentive in the form of a spherical triangle. The stability was perfect, being ensured by the resistance of four tunnel vaults, whose ends abutted against the great arches supporting the dome, and which covered the adjacent bays of the side aisles, the sanctuary and middle aisle (55).

Armenian construction further attempted a combination of g great ribs and compartment panels, whose realization over the porch-mausoleum at Akhpat (1183)(54, 3,4) presents the twofold interest of a singular analogy to certain parts of the covering of the Mosque of Cordova (page 225), and of an enigmatic resemblance of its principle to that, whose application constitutes the fundamental character of "Gothic"construction. (Volume III).

The roof was of stone and consisted of a covering of slabs in proper form, being in two slopes over the middle aisle and in one over the side aisles; finally as a polygonal pyramid above the dome (51; 55).

Chapter 4. Effect.

Besides constituting an essential element of the school, t the Armenian conception of architectural effect is original and happy, in good measure. 1

Note 1. What has been said of the singular resemblance of the Armenian formula of the 10 th, 11 th and 12 th centuries to the "Romanesque" of the West is especially verified, when the comparison of the two schools relates to the effect.

And first, it is striking by the very great care for the external appearance, which differentiates from oriental esthetics. It is further remarkable for a total indifference to t the impression produced by material greatness; most of the e edifices are quite small, and the greatest dimension of the more important does not attain 115 ft. 2

Note 2. The greatest length and width of the Patriarchal Church of Etchmiazin respectively do not exceed 108.3 and 95.2 ft.; for the cathedral of Ani, the corresponding dimensions are 105.0 and 65.6 ft.

Effects of Monumental Relief.

A characteristic no less marked is a passion for the picturesque in monumental taste, that is equally revealed by the general shape of the buildings, their secondary modeling, the reliefs of the details and the style of the ornamentation.

The entirety is detailed and is distinctly slender; from a lower mass placed on a substructure, itself sometimes raised on a stepped platform, emerge four high aisles with sharp ridges; these radiate in cross form from a central cube, from w which rises an elevated cylinder culminating in a pointed cone. Frequently the projections of the lateral porches and sometimes the projections of an elevation on a many lobed plan add to the animation of the outline (51; 55; 57).

On the other hand, the separate reliefs of the masses multiply the variations in the form of strong cornices; the accented friezes, of flat arcades, that externally extend the entire height of the wall (56, 1,3; 57), and internally form a wainscoting on the lower part of the surface (53); the tall and narrow niches made singular by the V form of their horizontal sections (51; 52, 3,6; 53; 56, 3); the narrow windows with wide and projecting architraves; the monumental portals with rich enclosures and external splays; the round windows

(56, 1), and the sloping roofs.

Likewise for the modeling of details, it is diversified and vivid. Instead of pilasters are slender twin columns (56, 1, 2); a clustered form of pier, being a group of engaged supports, of the arch in distinct ribs (58, 4; 53); a mode of detaching the impost of the arch by arranging for it the support of a half column (58, 4; 53); a firm and contrasting profile of the mouldings (59); sometimes a festoon of orders; finally a complex jointing of the column (58), producing twisted shafts and Composite capitals, above which is a series of bulbs, collars, toruses and fringes, an impost in form of a cube covered by flat sculpture, or a bell variously and curiously wrought.

Effects of Ornamentation.

The sculptured ornamentation is attractive. Abundant and thick, executed in very low relief, but deeply sunken and consequently rich in contrasts of light and shadow (61), it is more effective because concentrated in certain places -- the fronts of gables and of apses, high and low friezes, enclosures of doors and windows -- and particularly when it is out of scale (60).

Its inspiration is essentially conventional. Rare are borrowings from plant and animal nature, being moreover greatly conventionalized, and still more the image of man, treated w with a rude chisel. [1] Normal, on the contrary, are geometrical forms grouped in symmetrical compositions; scrolls, arabesques, interlacings and frets. But the preferred motives of Armenian art, and eminently characteristic of its style, are imitations of forms suitable for laces; laces, ropes, plaits, twisted fringes, twists, network, fillets, festoons and fringes (61).

Effects of Harmonic Order.

Yet, however strong the taste of Armenian architecture for rich picturesque effects, it did not exclude the love and feeling for those of the harmonic order.

The relief just analyzed satisfies logic and sacrifices itself in large mearure to the principle of order.

Note 1. Note on the walls of the Church of the Monastery of Aktamar scrolls of vine branches and figures of animals a and persons (Adam and Eve).

The exterior of the church announces its internal arrangement (51; 55; 57); likewise the membered forms of the support, in accord with the impost received by it, manifests its structural function (58, 4).

On the other hand, the radiating distribution of the upper mass of the church is remarkably united, while the care for regularity is emphasized, carried even to the worship of symmetry, in the method taken by Armenian architects of the second epoch to assimilate the rear facade of the edifice to the front facade; indeed they enclose the apse and the little apses in a rectangular mass, restricting themselves to suggesting the actual outline by means of two recesses of V section, sunken on each side of the apse (51; 52, 356; 55).

Part II. Secondary Architectural Styles of Christian Western Asia and of Northern Africa.

After the series of the great schools of western Asia, that we have just presented, a systematic history of architecture should group three secondary dependent and eclectic styles:-- Premohammedan-Arabian, Coptic-Egyptian and Christian-African. Indeed, the two former proceed from those of Mesopotamia, Persia and Syria, the latter from those of Syria and Egypt.

Section I. Arab Architecture before Mohammed.

The southeast of Arabia (Arabia Felix, Yemen); the west and the centre of the peninsual; the country between the Mediterranean, the isthmus of Suez, the Red Sea (gulf of Akaba) and the Dead Sea; the plains and the desert inserted between Syria, Mesopotamia and Asia Minor, were the scene of an Arab civilization before Mohammed.

I. Requirements. -- Monumental Chronology and Topography. -- Influences.

Requirements. -- Monumental Chronology and Topography.

In antiquity, Yemen was celebrated for the wealth and luxury of its sovereigns and of its aristocracy, as well as for the monumental splendor of its cities; Saba, Hadramaut, Mareb and Nedjiran. [1]

Note 1. See Strabo, XVI, 4; Pliny the Elder, VI, 32; Diodoros of Sicily, V, 40, 47; Agatharcides (in the Geogr. Minor of Muller, I, 189).

Established from the 4 th century B.C. in the region south of the Dead Sea (Edom and Moab), masters of Damascus and of Coele-Syria in the 1 st century B.C., the Nabatean Arabs, who also dominated central and western Arabia, formed a powerful kingdom, whose independence was destroyed by the Romans in 105 A.D. Enriched by an active commerce in transit between Egypt, the Red Sea, Syria, Mesopotamia and the Persian Gulf, they loved to build, as proved by the magnificent tombs multiplied by them, particularly near Petra, their capital. (Volume I, page 501). At the beginning of the middle ages, they erected on the plateau southwest of the Dead Sea strong cities, provided with churches and cemeteries; such were Kornib, Abde, and Es Sbeita.

About the beginning of our era, the northern Hauran and the

region of Damascus were occupied by Sabean Arabs, who in the end embraced Christianity. In the decline of the 5 th century, they were reinforced by a new stream of immigrants -- Ghafnides and Rassanides -- likewise natives from Yemen, and w who also became Christians. Their princes were taken from t the family of Ghassanides, and derived important revenues from policing the desert, which they did on account of the caravans traveling from Damascus to the Red Sea and from Syria into Mesopotamia. They built monuments -- Gate of Honor of Raobat Ammon; churches, monasteries, and particularly castles for guarding strategic positions and points on the water; we cite those of Kasr-el-Abyad (Kharbet-el-Beida), En Nemara, K Kasr Amman, Maschita, Al Muwaquar, Kharani and Tuba.

Finally on the frontiers of Babylonia in the 3 rd century A.D. was founded an Arab state, whose fortunes were brilliant from the 4 th century until the epoch of the Mohammedan conquest (635); that of the Lakhmides princes, vassals of Sassanian Persia. Their capital was Hira -- south of and near Koufa, southeast of Meshed Ali (Nedjef) -- in a fertile country, whose capicity for productiveness was then greater than now, by reason of a better irrigation, and which formed one stop in the transit between the Persian Gulf, upper Mesopotamia a and Syria. Besides, the Lakhmides dominated the plains and the desert as far as to the Syrian border.

Rich from the revenues produced by their domains, royalties from caravans, tributes from the nomads, they were ostentatious and refined sovereigns, celebrated by Arab poets. Besides Hira, that Noman I (403-418) made an important city, they had to build strong castles to guard the caravan routes; -- Al Khawarnaq near Nedjef; Sedir (at the beginning of the 5 th century); Qual'at Sham'oun in the oasis of Shifatyah; Al Okhayder (1 st half of the 6 th century), the last being still well preserved, and perhaps to be identified with the famous Kasr de Sindad mentioned by Arab authors. [1]

Note 1. The Arab poet Montolomnis names ten of these castles. "If thou art master of Sedir, thou hast Bariq, Mobayidh, the Kasr de Sindad, the Nakhl, the Monabbiq, the Ghamr, Al Ahso, Sa, Daysoq, and the entire country from Quodisyeh as far as Djouf" (i.e. from the Euphrates to the Nabatean country).

According to Massignon, Comptes Rendus de l'Academie des Inscriptions, 1909, page 205. Let us note that Al Okhayder is attributed to Mohammedan art. (See Reuther, Ocheidir, 1912).

Influences.

Considering its special nature and the historical conditions of its development, it was fated that Premohammedan civilization should be dependent and eclectic in remard to architecture.

Essentially military, it must have oeen impressed by Roman fortifications, revealed to it by the camps posted on the Syrian routes (El Kastal, El Leggun etc.).

In the eastern portion of its area, it was dominated by the Mesopotamian-Persian art of the Sassanian epoch. At the west, at first attracted by the Hellenism radiating from Alexandria,[1] and Antioch, it was later influenced by the Syrian school, itself strongly affected by Sassanian; finally it was three-fourths conquered by the latter (622).

Note 1. See the fanciful elevations of the facades of Nabatean tombs and of unreal architecture exhibited by Pompeian mural paintings of Alexandrine inspiration. See Volume I, F Figs. 335, 350.

II. Programmes and their Realizations.

Without mentioning the churches of the country of Edom, which were designed in the fashion of Syria, what we know of t the productions of Premohammedan Arab architecture is reduced to strong castles and a gate of honor.

The pragsamme of the former was directly inspired by that of the Roman camps (63). It required the enclosure of an area, almost always square and rarely rectangular, by a wall flanked by towers, whose height might attain about 65.6 ft.[2] with battlements, archers' slots, and sometimes a covered passage and a guard room over the gates. These were in number, sometimes one (63, 5,6), sometimes two (63, 4), sometimes being four in the Roman manner, at the ends of the axes (63,2), were not always the object of a special defense; always being freely opposed to the assailants the obstacle of a long and narrow passage, or of an enclosed court (63, 4,5,7).

Note 2. See Okhayder.

The lodgings of the officers, barracks, stables and store--

nouses were built against the enclosing wall around one or m more courts. It was the rule to establish baths and latrines.

The dimensions were frequently imposing; the ruins of Maschita, of Tuba and of Al Oknayder respectively measure 500, 510 and 558 ft. on a side. On the contrary, for those of Kharani, the corresponding side does not exceed 105 ft.

If it was necessary to foresee the sojourn of a prince, the plan comprised a divan. That of the Palace of Maschita was arranged at the rear of the enclosure and opposite the entrance. Monumental, it consisted of a a great vestibule (63, 7), (7) and a throne hall (8); the former being in the form of a basilica, with three aisles, the middle one wider than the side aisles and separated from them by porticos; the second was composed of a square area, from which projected in cross form three semicircular apses. [1]

Note 1. In brief, almost exactly the composition of the Basilica of the Nativity of Bethlehem. See page 44 and (25). For the plan with three apses, see page 29.

The gate of honor visible in the Citadel of Amman (63, 3; 64) was a rectangular mass pierced by two openings on the same axis; they gave access to a court likewise square, and extended at each side by a wide apse curved beneath a half dome. [3]

Note 2. See plan (63, 3).

Note 3. This is the arrangement of the court of the liwans of Persian mosques. See page 215 and Fig. 137.

III. Construction.

In a general manner the Premohammedan Arab monuments are w well constructed.

It is exceptional for their construction to be entirely in stone; [4] At the east on the frontiers of Mesopotamia, it is entirely of bricks of good manufacture; at the west, it associates bricks and stone, the former being employed for the enclosing walls, for the substructures, the jambs and isolated supports; the latter for the walls and the vaults. [1.]

Note 4. See the propyleum of Ammon, erected in a Roman citadel.

Note 1. See the bricks of Maschita.

The materials are respectively rubble, well cut and about 15.7 ins. high, and clay squares measuring sometimes 13.1 ins.

on a side and 2.9 ins. thick, and sometimes being 9.3 ins. s square and 2.5 ins. thick. [2]

Note 2. See the bricks of the Castle of Tuba.

The cut stone masonry of the propyleum of Amman is of fine quality, in the local Roman tradition. Everywhere else, the procedures are more or less derived from the Mesopotamian-Persian East. The stone wall consists of stone spalls between two facings; jointing with mortar is usual; openings are spanned by an arch with slightly pointed curve, in the Persian f fashion; the portico is an arcade, also pointed, that is supported by constructed piers, rather than by columns. [3]

Note 3. As an example of a portico on columns, see the vestibule of the divan of Maschita (63, 7 (7)).

The covering is formed by tunnel vaults and domes, built without centering; their profile is sometimes a Sassanian ellipse; [4] ordinarily being a slightly pointed arch. Exceptionally, the half domes of the gate of Amman are of cut stone m masonry in the Syrian style. (Page 54).

Note 4. See the vaults of the Castle of Al-Muwayquor.

The connection of the angles of a square area with a calotte is effected by the Persian artifice of a trumpet.

IV. Effect.

The Premohammedan Arab architecture had an entirely oriental conception of the effect, otherwise domenated in large measure by the limitations of a construction in rubble or in bricks.

Effects of Relief.

The part of the monumental relief is reduced to the modest chances of a part of the high niches crowned by half domes in Mesopotamian taste -- such are seen in the walls of the court of Al-Oknayder -- or of arcades analagous to those of the facade of the Palace of Chosroes at Ctesiphon, and such are shown by the court of the propyleum of Amman (64). [1]

Note 1. The arches exhibit a profile of a stilted arch, w which indicates Mesopotamian-Persian influence (66)(page 12).

The modeling of the details is slight and mediocre. Mouldings are rare and poor, or with a complicated and confused profile. At Amman is observed the series of sawteeth, familiar in brick architecture, and whose execution on a stone mon-

monument presents one of the numerous marks of orientalism o offered by that ruin (66).

The capital is often reduced to a tablet, as if the material were of bricks (66). Otherwise it is treated in the taste of central Syria, frequently cut as a bell with two rows of stiff and dry acanthus leaves, sometimes conformed to the impost and decorated by scholls. [1]

Note 1. See the capitals observed on the ruins of the Castle of Al Muwayquor and curiously ornamented with lily flowers.

Effects of Ornamentation.

On the other hand, ornamentation abounds; ornamental and s significant paintings on plaster; stone facings and mosaics; carefully wrought sculptures, flat but deeply sunken, in the Persian-Syrian taste (page 22), with lights in color and gilding.

The decoration was of the Asian type; continuous, current and covering, producing appearances analogous to those of lace or embroidery, even of a mural fabric. [3] Regular and symmetrical, it formed panels, scrolls and borders (65; 66).

Note 3. On the facade of the Palace of Moschita, a frieze extends to a length of 154.2 ft.

Inspiration could not, so to speak, draw from the spring of plant, animal and human nature. [4] Eclectic, it combined some Hellenizing motives borrowed from Syria -- acanthus and palmatium -- with a majority of oriental elements -- geometrical figures or symbolical images, otherwise over-conventionalized; on the one hand, the zigzag and rosette dear to Mesopotamia and Persia; on the other, the pineapple, likewise a native of Persia, and the vine branch -- or both a Semetic and B..sian sign of the idea of life -- and the vase, from which are drinking birsd, animals or men, or from which indeed rises a tree (65; 66).

Note 4. See the exotic animals -- Ox-zebus and lions -- r represented by the sculptures of Kasr-el-Abyod.

Section II. Architecture of Coptic Egypt.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Conditions. -- Influences. -- Radiation.

I. Requirements.

Nowhere was the propagation of Christianity more triumphant than in Egypt. While Hellenizing Alexandria became from the end of the 2 nd century one of the focuses of Christian theological speculation, [1] the mass of the people, whose mentality remained the same as in the period of the Pharaohs, turned to mysticism, and for the solitudes of the Thebaid and of Nitria, supplied thousands of enthusiasts for the contemplative life, hermits or monks. [2]

Note 1. Alexandria was enlightened by S. Clement of Alexandria (died 217) at the change from the 2 nd to the 3 rd century; in the 3 rd by Origen; in the 4 th, the ardor of speculation produced there the Arian heresy.

Note 2. At Oxyrhynchos (Behneso) in the 5 th century were counted 12 churches and still more monasteries; at the same time the diocese contained not less than 20,000 monks.

There ensued an important religious demand, that the Arab conquest (640) reduced without suppressing it. [3] Its results are imperfectly known, because many of the monuments have been destroyed, and attention has been directed from their ruins by the prestige of the antiquities of the Pharaohs. Indeed the interest presented by Coptic art is more historical t than esthetic.

Note 3. The caliphs of Cairo were very tolerant.

II. Monumental Chronology and Topography.

In the period of the importance of Coptic architecture, which is limited by the middle of the 4 th and the end of the 7 th centuries, there may be distinguished two phases.

A primary one corresponds to the second half of the 4 th c century and the 5 th century, and is recalled by the Sanctuary of S. Menas, which is southeast of Alexandria and groups a great Basilica erected by Arcadius (395-408), a hospital a and various structures; [1] by two Monasteries founded by the fanatical Schenoudi of Atripe on the border of the Libyan desert, west of Sohag; the Red Monastery (Deir-el-Ahmar or Anba Bischai) and the White Monastery [2] or of S. Schenoudi (Deir-el-Abaid, Deir Anba Schenoudi); by the Monastery of S. Simeon

(Deir Anba Samaan) on the left bank of the Nile opposite Assouan.

Note 1. Place of burial of the saint, the aim of one of the most celebrated pilgrimages at the beginning of the middle ages.

Note 2. So called because of the rare peculiarity of its construction in stone.

A secondary one comprises the 6 th and 7 th centuries and has for evidence; the Monastery of S. Jeremiah at Saccara; t that of Baouit, a little north of Siout; the group of monasteries at Negada, north of Luxor; the principal one being the Monastery of the Angels (Deir-el-Melak) with four adjacent churches; the four monasteries of the valley of Wady Natroun (desert of Nitria), consecrated by S. Macaire (295-390); Deir Abou Makar, Deir Baramous, Deir Anba Bischai (Monastery of S. Isaiah), Deir Souriani (Monastery of the Syrians). From this epoch also dates the foundation of the churches of the old Cairo, erected within the enclosure of the Persian-Roman fortress of Babylon -- Abou Sarga (S. Sergius), El-Moallakha (the Suspended), [1] Mari Girgis (S. george), Sitte Burbara (S. Barbara), El Adra, etc.; but excepting the crypt of the first, their actual state results from restorations and reconstructions.

Note 1. I. e. "on columns".

III. Conditions. -- Influences. -- Radiation.

The development of the Coptic architecture was closely restricted by the nature of the country, for the description of which we refer to Volume I of this work (page 25), and by t the scarcity of workmen long deprived of the opportunity for working.

Its orientation depended in very limited measure on Hellenistic art, of which Alexandria was still the capital, and it was scarcely affected by the Byzantine. On the contrary, it was determined by the persistence of the traditions of the P Pharaononic period; by an energetic reaction of the national genius against Hellenism; [1] by Coptic mysticism; finally by a strong influence of the Persian-Mesopotamian and Syrian schools. [2]

Note 1. This reaction was favored by the aversion of the Church to pagan civilization. Note the savage destruction of Hellenistic monuments by Theophilus, Patriarch of Alexandria,

by the monk Schenoudi, etc.

Note 2. Persian influence affected construction; Syrian t the decoration.

In its turn, Coptic art radiated in correlation with the e extension of Egyptian monachism, and as regards decoration, with an active exportation of painted or embroidered fabrics, that Egypt manufactured on a great scale. It particularly acted on northern Africa. (Pages 117, 118, 120).

Chapter 2. Programmes and their Realizations.

The programme of a Coptic church is a variation on the theme of the basilica with three apses; several peculiarities o observed on the monuments listed result from the monastic destination of most.

There are universal, the suppression of the atrium, replaced by a narthex with basin for purification (69, 1-3); enlargement of the sanctuary, that is masked by a screen, equivalent to the Byzantine iconostasis (69, 1-12; III, 4); the construction of a choir as a wide transept, closed on the side next the nave by a perforated screen, or even by a masonry p panel with doorways (69, 1-11; II, 2,3); opening of lateral entrances (69, 2,3,4).

Others are common, such as the introduction of galleries f for separating the sexes, or without these, by dividing the nave by a transverse barrier (69, 1).

Finally, some are more or less frequent; these are a trefoil shape of the sanctuary (69, 2); [4] a repetition of the apse on the front end of the nave (69, 4); [5] a return of the side aisles forming an ambulatory at the front end of the church (69, 3); [1] the addition of lateral chapels (69, 3); [2]

Note 4. See the "White" and "Red" Monasteries near Sohag.

Note 5. See the Church of Erment, measured and drawn by t the scientists of the expedition to Egypt.

Note 1. See Deir-el-Souriani and Deir-Anbo-Bischoi.

Note 2. See Deir-Anbo-Bischoi.

Also note that in upper Egypt, many sanctuaries are partly or entirely buried in the mountain, like the hemispeos or speos of the Pharaohs. (Volume I, page 57).

Everywhere in accordance with atmospheric conditions and with Coptic mysticism, lighting is scarce and is sparingly d distributed by narrow openings placed in the tops of the walls or in the dome (70).

Chapter 3. Construction.

From the point of view of construction, the Coptic school is inspired by Mesopotamia, Sassanian Persia and Pharaohonic Egypt, far more than by Alexandrine Hellenism.

Although it was not prevented from taking stones from the monuments of the past, [1] it normally built with crude bricks. It erected walls externally battering in the Pharaohonic mode, and made arched openings.

Note 1. Thus the materials of Deir-el-Abiad were stolen f from a temple of Ramses III.

When it had no antique columns at command, it freely made the isolated support a pier of square section. At the beginn-ning, it sometimes adopted the Hellenistic system of a portico with architrave; but it soon preferred the arcade, which was at first semicircular or elliptical, but became pointed after the 6 th century.

Having rejected the Hellenistic formula, it realized the c covering by means of vaults, erected without centering; it either built tunnel vaults over the aisles and erected a dome over the sanctuary, or -- the practice was late -- it multiplied calottes above the entire edifice. For the profile was at first adopted the Egyptian ellipse (Volume I, page 71), a and then from the 6 th century an arch more or less pointed. It connected a shell to the angles of the square by the expedient of angle trumpets, and abutted it by means of half domes (70). [2] It was acquainted with the practical method of abutting a tunnel vault of the middle aisle by two rampant half tunnel vaults over the side aisles, [3] which by a curious analogy was familiar to several schools of the western Romanesque. (Volume III).

Note 2. See the "White" and "Red" Monasteries at Sohag.

Note 3. Witness the drawings by the scientists of the expedition to Egypt. (Antiq. IV, Pl. 67; the covering of the Church of Deir-Abou-Fonetz).

The roof was formed as a terrace; the domes had nothing but their external surfaces.

Chapter 4. Effect.

I. Effects of Relief.

Coptic architecture was dainty in effect and with a picturesque tone, at least in regard to the internal appearance. For it was entirely indifferent to that of the exterior, making the form of the edifice a truncated rectangular pyramid crowned by an Egyptian cornice (Volume I, page 79).

The arrangement of the interior presents some endeavor for monumental secondary relief, rare and less frequent as the e epoch considered is more recent, otherwise opposed by construction in bricks; animation of the wall by alternation of a niche and a free column; [1] marking its top by a cornice (70); accenting the arches by a moulded archivolt (70); resting their imposts on columns, free and standing before the piers (70); enclosure of a window opening or trumpet of the dome by an arch on small colunms, and a projecting sill (70). [2]

Note 1. See the Monastery of Sohag and that of S. John at Antinoe.

Note 2. As an example, see particularly the "White" monastery at Sohag.

As for the relief of details, the part therein taken by Coptic architecture was very small and never comprised only miserable results. Frequently a projection scarcely marks the limit between the pier and the arch; sometimes even, the surface was continuous. [3] The Church of Deir Baramous presents an example of modeling of the front surface in the image of a pair of coupled cylinders. The capital of the column exhibited either a coarse imitation of the Corinthian type, a repetition of the Byzantine impost block or a truncated cone, or mediocre forms outlined as a bulb or a bell with foliage.

Note 3. See Church of Deir Souriani in Nitria.

II. Effects of Ornamentation.

In brief, it is by ornamentation that Coptic architecture satisfied its passion for effect. It required from painting more than from sculpture, not only because constructing in bricks it employed plastering, but also because of a taste f for color, that it had inherited from its Alexandrine and Pharaoahnic ancestors. (Volume I, pages 386, 104).

As for inspiration as well as for style and technics, Coptic

decorative sculpture was derived from that of Syria (page 67), flat and dry, carved in collars, otherwise often weak and coarse, it was devoted to floral and geometrical motives (68). More at ease in wood, it produced remarkable woodwork from t the 7 th century [3] and currently in the 11 th and 12 th. [4]

Note 3. See Deir Souriani.

Note 4. See the churches of Cairo.

Very superior, and in regard to the restricted lighting of the interiors, painting in motley arrangement and hard harmonies of bright red, emerald green, ochre, violet and white. Facings of marble and mosaics were rare.

Although essentially ornamental, its repertory comprised a mode of significant illustration, elsewhere confined to the sanctuary. At first picturesque and decorative, in the Alexandrine fashion, it soon became historical, devoted to the representation of subjects taken from the Bible. On the whole, the style was conventional, but the faces manifested in a remarkable degree the taste and feeling for portraits (71). [5]

Note 5. See the decorative painting of the Pharaohonic monuments.

Painted or sculptured, the ornamental decoration was characterized by the continuity of compositions extending over great surfaces and very rhythmical in the entirety as well as in details, with an extensive conventionalization of the plant model; finally by the preponderance of the geometrical motives; these were leaf or flower arabesques, dominated by the v vine and frequently animated by doves or the lion of the Apocalypse, plaits and spirals; interlaced squares, lozenges, o octagons and circles; with crosses scattered in the network. (68; 71; 72).

On the whole, an appearance of rude luxury, singular originality, of primitive and rough art.

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Section III. Christian Architecture of Africa.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Influences.

I. Requirements.

The Chrirtianity of Africa was a model of fervor, a nursery of martyrs, doctors and monks. [1] On the other hand, in the n number of cities, the Donatist heresy doubled the need of religious edifices. Thus in the course of the 4 th and 5 th c centuries, there was a swarm of ritual churches, of commemmotative chapels and of monasteries. Opposed by the first invasions of the Vandals from 477 to 523, and by the persecutions directed against the Catholics by the Arian Huneric and h his successors on the Vandal throne, the demand increased at the accession of Hilderic, who restored toleration; after 534 and especially in Tunisia, it was favored by Byzantine domination, which also involved numerous works in fortification. But it was suppressed at the end of the 7 th century by the Mohammedan conquest (698-708).

Note 1. See Tertullian, S. Cyprian, S. Optat, S. Fulgentius and S. Augustine. In the decline of the 4 th century, S. Augustine brought to Italy the rules of the monostic life, w which rapidly acquired numerous disciples.

II. Monumental Chronology and Topography.

Unfortunately, the quality of the producition of the Christian architecture of Africa lacked much of corresponding to their quantity, and they have been almost entirely destroyed to the lewel of the ground.

.'7 Most of the monuments may be dated from the 4 th century a and the first two-thirds of the 5 th, without its being possible to accurately fix their dates.

To limit ourselves to ruins of some importance, we cite the Churches of Announa (Thibilis), of Benian (about 435); of Carthage (Basilica of Damous-el-Karita); of Castiglione; of Dermech; of Dar-el-Kous (Kef); of Henchir-el-Atech, between Satif and Batna; of Henchir-Msaadin; of Kherbet-bou-Addoufen, n near Setif; of Kherbet Guidra, northeast of Setif (first half of 5 th century); of Matifou, near Algiers (4 th and 6 th centuries); of Morsott, north of Tebessa; of Orleansville (324, restored in 475); of Siagu; the considerable entirety of the

Basilica of Tebessa and of its ritual and monastic additions (4th-5 th centuries); the Churches of Thabarca (5 th century); the great Basilica of Tigzirt (middle of 5 th century); the ruins of a monastery at Timgad; the Basilica of S. Salsa at Tipasa, near Cherchell (4 th and 6 th centuries); the Church of Upenna. As examples of fortifications may be cited those of Bagai, of Tebessa, of Bordj-Hallal, of Haidra, of Thalapt.

III. Influences.

In spite of the proximity of Italy and the relations of the African church with Rome, the architecture of Africa shows itself entirely independent of the "Latin". (Volume III). On the other hand, it is connected with the schools of Syria and of Egypt.

Chapter 2. Programmes and their Realizations.

The programme of the African church is that of the normal basilica, orientated to the East. The nave was commonly divided into three aisles, the middle one being wider and higher than the others. But there exist several examples of a more subdivided distribution (74, 6) (5 aisles at Orleansville and at Tigzirt; 7 at Matifou and at Tipasa; 9 at Tipasa ((second state), at Damous-el-Karita of Carthage); this appears to have been determined by the desire to relieve the carpentry of the covering. [1]

Note 1. In several edifices (Tipasa, Matifou etc.), an increase in the number of aisles occurred after their erection.

Galleries are exceptional, [2] and the known examples are of the late epoch (76, 1).

Note 2. As an example may be cited that of the Church at Tigzirt..

The apse was regularly elevated -- often about 8.3 ft. -- and was accessible by steps arranged at the ends of its front (74, 7; 75), ordinarily terminating in a semicircle; [3] but it was often -- in the Syrian fashion -- externally enclosed in a rectangular mass (74, 1), or even entirely concealed by the rectangular form of the rear of the edifice (74, 3,6,7). In the oriental fashion, it was generally flanked by a chapel and a sacristy, both of rectangular plan (74, 3,5,7). Very frequently the altar occupied in the nave the centre of the enclosure by a chancel (74, 3,5,7); at other times it was placed at the border between the apse and the nave (74, 1). S Several sanctuaries are known, beneath which were constructed crypts (74, 7). [4] Some Churches -- Orleansville and Matifou -- have an opposite western apse, added to the edifice with the purpose of a tomb (74, 6). [5] Lighting was ensured by openings pierced in the upper zone of the walls of the great aisle and in those of the side aisles. The facade of the Church of Announa exhibits windows opened at each side of the doorway, that produces an arrangement characteristic of the art of northern central Syria (76, 3).

Note 3. At Tebessa (76), the apse is single and in horseshoe form.

Note 4. See the Churches of Benian and of Castiglione.

Note 5. See examples of the same procedure in Egypt, page109.

119 Almost always -- a peculiarity indicating Syrian influence -- the atrium is wanting; [1] it was replaced by a vestibule, sometimes opened as a portico (74, 9), more frequently enclosed (74, 8,10-13), occasionally between two towers, [2] as in Syria;
120 doorways were freely opened in the longer sides of the church; sometimes even, there was no entrance in the facade.

Note 1. As an exception, we cite the Basilica of Tebessa (142, 3).

Note 2. See the Church of Morsott.

The trefoil plan was freely adopted for funerary churches, familiar to Egypt and Syria (74, 2,3); [1] the Baptistery of T Tigzirt presents a specimen of a radiating quatrefoil outline. (74, 4).

Note 1. See Basilica of Tebessa (annexed chapel); that of Kherbet-bou-Addoufen, that of Damous-el-Karita at Carthage.

Chapter 3. Construction.

In a general way, the Christian school of Africa built very badly. Aside from some very rare exceptions, [2] it never employed cut stone, but a sort of framework of stones was common for ordinary structures after the Roman epoch (Volume I, page 479); this was a rubble about 1.6 ft. thick, strengthened by the cutstone blocks at intervals of 2.6 to 6.6 ft. Openings were spanned by lintels relieved by arches, leaving the tympanum open in the Syrian fashion (76, 3), and which sometimes consisted of a stone hollowed out beneath, as in that country.

Note 2. See Churches of Tebessa (75), Tigzirt and Timgad.

The isolated support was sometimes treated as a column -- almost always borrowed from an antique edifice; sometimes as a built rectangular pier; occasionally as a pair of twin columns set transversely to the axis of the nave. [2] The portico was an arcade of semicircular arches (75, 76, 1; 77, 1).

Excepting apses and narrow aisles, the first being vaulted by half domes and the second by cross vaults, the covering w was constructed of wood. An artifice familiar to northern S Syria -- the erection of two columns superposed before the supports of the portico, reduced the spans of the beams (75; 77, 1). [3]

Note 3. See Tebessa and Tigzirt.

Chapter 4. Effect.

Considered with regard to the effect, the religious monuments of Christian Africa reveal themselves as entirely insuff-
122 icient; the best rise but little above mediocrity. [4]

Note 4. The only remarkable monument is the Basilica of Tebessa, whose composition is picturesque and monumental.

Their dimensions were small, [1] and their sculpture was rudimentary. [2] When not second hand, capitals and bases were sim-
123 plifications, even caricatures of Greco-Roman orders, particularly of the Ionic and Tuscan (77).

Note 1. Great Basilâco of Tipasa, 171 × 148 ft.; Basilica of Tebessa, 151 × 72 ft.; for important edifices, a length of 82 to 112 ft. is quite common.

Note 2. We cite some rare examples (at Matifou and Dar-el-Khous) of the animation of a wall of an apse by means of small free columns, also notable at Tebessa (75), Tigzirt and Tipasa, a method of resting the triumphal arch of the apse on columns set before the piers.

The sculptured ornamentation was rare, flat, heavy and coarse. They made up for it by painting and particularly by mosaics, covering pavements and mural facings. [1]

Note 1. See the relatively luxurious decoration of the Basilicas of Tębessa, Thabasca and Tigzirt (76, 1; 78).

The ordinary motives were very simple geometrical ornaments -- cables, plaits, guilloches and beads -- often entirely in the Syrian taste (78) and symbolical figures -- monogram of Christ, dove holding olive branch, mystical lamb, vine branch, vase of life of man, in which grows a vine with peacocks facing it.

Part III. Third Epoch of Egean Architecture.

Section sole. Byzantine Architecture.

After an interval of a thousand years, the Egean region renewed under analagous conditions the work of combination and of selection, which it had accomplished with so much success in Hellenic times. Like the Grecian, Byzantine architecture had for its proper area the countries around the Egean Sea-western Asia Minor, Greece, the Archipelago and Macedon, with Constantinople as their centre; like it again, it radiated o over the riverside connections of the eastern Mediterranean; and finally like it, it composed a formula of conclusion and compromise:-- termination of the architectural researches of antiquity; a compromise between the esthetic ideals of the E East and the West, but this time to the advantage of the former.

In the career of eleven centuries (from the 4 th to the 15th th) supplied by Byzantine architecture may be distinguished two phases of prosperity and impetus (4 th, 5 th and 6 th centuries -- last third of 9 th, the 10 th, 11 th, and first half of the 12 th centuries), separated by a period of depression (7 th and 8 th centuries; first and second thirds of the 9 th), and followed by a period of decline, terminated by the Turkish conquest in the middle of the 15 th century. [1]

Note 1. The study of Byzantine architecture is opposed by the destruction of numerous monuments; by the uncertainty in date of many of those remaining; finally, for many religious edifices, by the disfiguration resulting from their appropriation to Mohammedan worship.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Epochs. -- Schools.

I. Requirements.

By the number, importance and diversity of its appeals for the services of architecture, Byzantine civilization realized indeed more than necessary, the primary condition for the flourishing of the art of building. For the multitude of undertakings, largely endowed in general, that it proposed, comprising those of secular as well as of religious purcoses, of luxury as well as of utility, official as well as private. On the one hand, public and civic works of utility or ostentation,

fortifications, both grandly conceived; on the other being t the realization of comfortable dwellings, suited for a numerous and wealthy citizen class, sumptuous mansions for a rich aristocracy, passionately fond of splendor, marvellous palaces for the emperors with the means and the desire to dazzle and to astonish; [1] finally as a result of the fervor and devotion tinged with superstition and confined to ritual practices, the erection of churches by hundreds, often monumental and magnificent, and of vast monasteries, complex groups of sanctuaries, chapels, monastic buildings, shops, inns, hospitals and schools.

Note 1. The imperial revenue in the time of the Macedonian dynasty is estimated at about $600,000,000. At the death of Basil II (1025), the treasury contained a reserve of $200, 000,000.

II. Monumental Chronology and Topography.

1. From the 4 th to the middle of the 9 th century.

When the West was weakened by anarchy and invasion, vegetating in misery and infected by barbarism, the Egean region enjoyed peace and was enriched by an intense industrial and commercial activity, remaining faithful to the tradition of Hellenistic and Roman luxury.

To the general course of the demand produced by the triumph of Christianity was added after 327, that originated by the transfer of the seat of the empire to Byzantium. Promoted to the dignity of a capital, of a "second Rome", that provincial city of the second order became a feverish building area under the energetic impulse of Constantine, maintained by his successors in the course of the 4 th century. The productions consisted of aqueducts, sewers, colossal cisterns, forums surrounded by porticos -: Forum of Constantine, Forum of Tauros, and the Augusteion; of streets with colonnades, such as the grand central Avenue (Mesea); of baths -:of Zeuzippos, Achilleos, of Eudoxia and of Arcadius; of circuses, like the famous Hippodrome with its grand imperial gallery (Kathisma); of official structures -- the Sacred Palace for the sovereign, with vestibule (Chalce), residence (Daphne), throne hall(Augusceus, consistorium, Magnaura), banquet hall (Triclinios with 19 couches) etc., Palace of the Senate, Treasury, Prefect-

Prefecture of the city; of commemmorative monuments -- Triumphal Arches of Constantine and of Theodosius, Columns of Theodosius and of Arcadius; finally, the sanctuaries, among which are distinguished the churches dedicated by Constantine to the Divine Wisdom (S. Sophia) and to S. Irene, and the Martyrs' Church consecrated to the memory of the S. Apostles. [1]

Note 1. In Constantinople alone, Constantine erected 21 c churches !

From this great undertaking remains only the memory. Indeed the haste of the work condemned to premature ruin edifices, which besides were merely the current productions of the Hellenistic-Roman art in its decline.

128 For the work of the 5 th century, we possess monumental documents. If constantinople can no longer pride itself on the magnificence of the Golden Gate, that Theodosius II (408-450) erected about 447, it retains portions of the walls by which that prince enclosed it, and vestiges of the fortified Palace of Boucoleon. From the year 463 has endured the Church of S. John Stoudion (Emir Achor Djami Mosque).

At Thessalonica (Salonica), where the art benefited from t the concurrence of the rare economical prosperity, brilliant civilization and great intellectual activity, were erected at the beginning of the century the Church of S. George, and toward the middle, that of S. Demetrios, as well as the Sanctuary of unknown Christian name, of which Islam has made the Mosque of Eski Djouma.

On the other hand, the reality and importance of the religious demands of Asia Minor during those two centuries is attested by the Church of the Trinity at Ephesus, by S. John and S. George of Sardes, by the Basilicas of Philadelphia (Ala S Shehr), of Pergamon and of Hierapolis, etc.

The Church of S. Sophia at Salonica shows, that at the change from the 5 th to the 6 th century, Byzantine architecture attempted great innovations with very important consequences. (Pages 148, 160). Toward the end of the first third of the 6 th century, its progress resulted in a splendid undertaking, an imposing manifestation of maturity and temperament, on the one hand favored by the fever for building aroused in Justinian (527-565) by pride, by interested devotion, and also by

an elevated conception of his imperial role; on the other, t the political and economical impetus of the empire under his reign, as well as the ravages of the riot, named the sedition of Nika, which in 532 destroyed a part of the monuments of t the capital.

The demands of Justinian were of all kinds.[2] We cite among these of public utility the cisterns called by the Turks Iere=batanserai and Bin-bir-direk (1001 columns), the latter (528) being a masterpiece of the art of building; the Aqueduct of Constantinople, likewise a model of science; a reconstruction of the Zeuxippos, burned in 532; a Bridge over the Sangarios in Bithynia; the fortifications of Nicea, of Dara, of the Monastery of Mt. Sinai, and of Haidra in Africa; among those of municipal character, an embellishment of the Augusteion; in the list of official monuments, a new Palace of the Senate at the Augusteion, and in that of sumptuary structures, a rebuil-
29 ding of the Chalce in the imperial Palace; in the religious
30 series, the Church of Ss. Sergius and Bacchos, erected soon after the accession of the sovereign; that of S. Irene (532); that of S. Apostles (536-546), destroyed, but to be imagined from a description[1] and from related buildings;[2] particularly S. Sophia (532-537), the "Great Church", one of the marvels of universal art, whose erection by the care of two artists of Asia Minor, Anthemios of Tralles and Isodoros of Miletus was one of the chief affairs of the reign.[3]

Note 2. They furnished the historian Procopius with the m material for a book; De Aedificiis.

Note 1. See Procopius, De Aedificiis.

Note 2. S. Marco of Venice and S. Front of Perigueux.

Note 3. In 553, S. Sophia suffered from an earthquake; the dome fell in 558; it was rebuilt in 558-562 by a nephew of I Isodoros of Miletus, of the same name; it was afterwards strengthened by great buttresses.

As much as the epoch of Justinian had been propitious to t the flourishing of the art of building, just as little were the three succeeding centuries. At first, until the accession of the Isaurian dynasty (717), the empire passed through a mournful epoch of anarchy and of disastrous reverses; then after order and peace had been restored, to the political or-

crisis succeeded a religious one, resulting from the quarrel of the iconoclasts, otherwise stated to be a twofold struggle of reason against the idolatry of the worship of images, and of the lay principle against the invasions of monachism. Doubtless building continued; there even appear the development of some germs of novelties, notable in the productions of the Justinian school. Yet the impulse was weakened, and we can only cite the embellishment of the imperial Palace; a luxurious hall of state, called Chrysotriclinos, erected by Justin II (565-578); two others, the Lausiacos and the Justinianos, were works of Justinian II at the end of the 7 th century; the Church of the Virgin of Pharos (middle of the 8 th century); finally, a magnificent residence, called Triconque, erected by Theophilos (829-842); the churches of Constantinople, by the Turks made into the Mosques of Kalender-hane-Djami and Hodja-Mustapha-Pacha (7 th century), that of Athens called t the Little Metropolitan or Panagia Gorgopiko (beginning of t the 9 th century).

2. From middle of 9 th to middle of 12 th century.

The Macedonian dynasty (867-1057) restored conditions analagous to those existing in the 6 th century. Delivered from anarchy, strengthened by the resumption of a part of its lost provinces, benefited by immense economical resources, exalted by brilliant conquests of its enemies, and impelled by the i impulse retained by the minds from the long "quarrel about t the images", the Byzantine world sacrificed to luxury and art more than it had ever done.

The government, in particular, organized fascinating representations, and most of the sovereigns, without counting the cost, applied themselves to the creation of a fairy stage of their official and private life.

The founder of the dynasty, Basil I (867-886) gave an example by ordering a comfortable and luxurious Palace, the Kenourgion, and only in Constantinoble 48 churches, the principal one of these, the "New" (Nea) was consecrated in 881 and is known by accurate descriptions. [1] From the second half of the 9 th century, without being able to fix the time of their erection, date the Cathedral of Heraclea (Eregli) on the Sea of Marmora; the Church of Dormition at Nicea; the church of Skri-

Skripon in Beotia (874); at Constantinople are the Sanctuaries, which have become the Mosques of Atik-Mustapha-djami and of Gul-djami.

Note 1. See Constantine Porphyrygenete, Life of Basil; Photius' Homilies.

To the account of the 10 th century may be assigned a transformation of the Palace of Boucouleon by Nicephoros Phocar (963-969); the Oratory of the Saviour, that John Zimisces (9 (969-975) had built to find therein a tomb. The Monasteries of Lavra, of Iviron and of Vatopedi on Mt. Athos are evidence of the epoch of monastic impulse at the change from the 10 th century to the next.

Of the production of the 11 th century, doubtless greater, and that may be dated from the first half of the period, two Churches of Salonica, that of S. Elias and of Theotokos, [2] now the Mosques of Eskiserai and of Kazandjilar-djami; [2] one at Constantinople became the Mosque of Boudroun-djami; two at the Monastery of S. Luke in Phocide; that of S. Nicodemus at Athens; that called Nea Moni at Chios (about 1050). Let us add as vanished but described, the important Peribleptos built by Romain III (1028-1034). As for the second part of the century, the monumental inventory attributes to him the Churches of Constantinople named Theotokos (Kilisse-djami) and P Panachrantos (Fenari-Issa-Mesdjid), and that of the Monastery of Daphni, contemporary with the last end of the century.

Note 2. Sometimes erroneously named S. Bordias.

The third quarter of the century was again a period of ana-
.32 rchy and failure. But then after a hundred years, the dynasty of Comnenes (1081-1185) maintained the empire in a state of power and relative prosperity. Architecture was anew desired to erect palaces, churches and monastic chapels; such w was at the end of the Golden Horn the splendid Castle of Blachernes; at Constantinople, such were the Churches of Mene t tes Choras (Kahrie-djami), of Pantocrator (Zeirek-djami), of Pantepopte (Eski-djami), all three dating from the first half of the 12 th century; such again were the Church of Meroaca and that of Nea Moni near Nauplia (1144), erected about the middle of the century; S. Pantelimon at Salonica; of Kosmoso-
.33 teira at Feredjik in Thrace (1152); S. Theodore and the Kap-

Kapnikarea at Athens; S. Sophia of Monemvasie etc.

The production of the three centuries just reviewed manifests, indeed in all relating to the programme with regard to construction and effect, a fruitful energy, generating new arrangements and a more elegant appearance. [1] This truly authorizes the appellation of the "sacred golden age", which has been proposed for this phase of the career of Byzantine art.

Note 1. In the pages that he devoted to the buildings of Basil I, Constantine Porphyrygenetes insists on the "novelty of the distribution," on the "charm", grace and elegance" of the arrangement.

3. From the decline of the 12 th century.

At the decline of the 12 th century commenced an epoch of irremediable decadence for Byzantine civilization. Under Angelus (1185-1204), the Latin emperors (1204-1261), the Paleologues (1261-1453), the empire entered into decomposition. Neither the government, without power and resources, nor private individuals, impoverished by a profound industrial and commercial depression, could furnish a secular demand. Constantinople ceased to give an example of great undertakings. -- We have to cite only the double Church, which the Turks m made into the Mosque of Fetije-djami; Salonica likewise restricted its demands, which are recalled only by the Church of S. Apostles (1312-1315), and that became the Mosque of Yakoub Pacha.

In fact, architecture found itself reduced to modest provincial programmes. Such were those of the Churches of Arta, n named Parigoritissa (end of 13 th century), S. Basil and S. Theodore (14 th century); the Church of Kalabaka (14 th century); the seven sanctuaries of Mistra, capital of the department of the Morea (six of the 14 th century); the Metropolitan (1312), S. Theodore, Panagia of Brontochion, Evangelisteria, S. Sophia, Perioleptos; one of the 15 th, Pantanassa; S. Sozon and S. Elias at Geraki in Laconia; the Monasteries of Meteora (middle of 16 th century) near Kalabaka in Thessaly, etc.; particularly structures extending the monastic group of Mt. Athos, from the 13 th to the 16 th centuries -- monartery of Chilandari (12-13 th century), of Pantocrator (1363), of Esphigmenou (14 th century), of S. Paul (15 th century) and

of Koutloumousi (1540). [1]

Note 1. For the three Churches of Trebizond -- Panagia Chrysophalos, S. Sophia, S. Eugenios -- occasioned by the establishment in that city in the 12 th century, of a branch of t the Comnene family, driven from Constantinople by the Latin conquest, see Part I, Section II of the same Book.

These edifices attest, that in spite of unfavorable conditions for a long time, Byzantine architecture **retained** the im-
35 pulse and remained capable of making innovations in details. Yet it was condemned to gradually lose creative energy and to pass into formulas and repetitions.

Chapter 2. Natural and Human Conditions. -- Influences. -- Radiation.

I. Natural Conditions.

The conditions of the career of Byzantine architecture, both natural and human, were favorable to its progress.

As for the former, we ask the reader to refer to the pages devoted to the two first epochs of Egean architecture. (Volume I, pages 177, 257).

We shall here limit ourselves to observing how the geographical position of Byzantium midway between Europe and Asia w was propitious for the success of a resumption of the effort to harmonize the esthetic ideals of the East and the West, f for which the Egean region seemed predestined; we shall also note the advantage that the architects of the capital must h have derived from the existence of magnificent quarries of P Proconessian marble in the vicinity of the city.

II. Hsman Conditions.

They again benefited by the ample resources placed at their disposal by official commands, as well as by the eary providing of abundant and skilful workmen, that on the one hand, c carried on for them the activity of an industry essentially artistic,[2] on the other, the frequency and the grandeur of the monumental undertakings; they derived no less advantage from the intellectual energy, that maintained the theological disputes, and from the 9 th century aroused a brilliant renaissance of Hellenic culture;[1] finally, they had at command technics relatively scientific and excellent tools.[2]

Note 2. Note particularly the marble industry of Proconnesus, which exported efor the elements of architectural ornamentation, particularly the capitals.

Note 1. The University of Constantinople was founded by T Theodosius II, but had declined, and the schools of Athens h had been closed by Justinian. Reorganized at the middle of the 9 th century, the former soon became an ardent centre of intellectual activity.

Note 2. The Byzantine name for the architect is "mechanicos"; note that one of the authors of S. Sophia, Anthemios of Tralles, wrote a treatise on machines.

Among the most distinctive traits of Byzantine civilization

were three, which must necessarily be reflected in the production of its architecture; an entirely Asian passion for ostentation and splendor; a subtle mentality, revealed by the equally traditional legendary refinements of an artful diplomacy and a cavilling theology (pages 151, 160-165); finally a conservative spirit, and a marked taste for formulas and regularity.

The art of building must participate in that last characteristic as much as possible, since it was in large measure official, [2] and because the mode of training architects and the system of work formed for it a powerful cause of unity in time, compensated indeed by another, equally energetic, of variety in space. There existed no schools in which architecture might be learned; the practice of it was the perquisite of a certain number of families interested in attaching themselves to it by reason of the immunities thereby assured, [3] methods and recipes being transmitted from father to son. On the other hand, the workmen were free laborers paid by the day or piece, grouped in societies and confined to the routine applications of certain processes. [4] Always for the workmen as f for the architects occurred examples of removals; indeed from time to time was a call to the capital, when great works were undertaken, and inversely the sending, sometimes to great distances, of plans, architects, foremen, and even of wrought m materials.

Note 2. The general direction of architectural works belonged to a functionary, named Oikistos. Like the count of the aqueducts, he was a dependent of the chancellor. As previously at Rome (Volume I, pages 440, 441), every enterprise was conducted by a responsible director, under whose control the architect operated.

Note 3. "Architects enjoyed immunity (exemption from all p personal burdens, so that they might more easily teach their children the practice of their art." Theodosian Code. (XIII, IV, 2).

Note 4. The society (corporation) comprised masters and c companions under the direction of a first master.

Note 5. See on the one hand, the attribution of the construction of S. Sophia to two masters from Asia Minor, and the

presence of masons from Isauria in Constantinople; on the other -- without speaking of the exportation of decorative elements in Proconnesian marble mentioned later -- the sending by the empress Eudoxia to Porphyros, bishop of Gaza, of a plan and columns for the church, that he proposed to erect in that city.

III. Influences.

We have previously announced, and the result of our analysis will confirm it later, that the orientation of Byzantine architecture was the result of a concurrence of various influences, emanating from the Hellenistic-Roman part; in Asia, from Mesopotamia-persia, Syria, Anatolia and Armenia; finally from the Gothic West, in a much smaller degree and later.

132 And first, it is inconceivable that the "second Rome"-- such was the significant name attached to Byzantium by Constantine --;may not have been in large measure according to the model offered by the ancient city; that the Roman nobility, transplanted to the new capital, may not in its new palaces have restored the arrangements and the appearances to which it was accustomed; finally and above all, that it may not have called architects famous in Rome. [1]

Note 1. Note that until the end of the 9 th century, Latin remained the official language of the Byzantine empire.

Yet it was fated that Roman art should find a victorious c
133 competitor in Hellenistic art, which then flourished in the great cities of the eastern Mediterranean, particularly at Ephesus, Antioch and Alexandria; so much the more because from these cities came the religious impulse. In fact, the masterpiece of Byzantine architecture, S. Sophia, was the rerult of the collaboration of a man from Tralles and of another from Miletur, and if in the end the influence of Hellenism suffered from the increasing vogue of the East, it resumed i its sway in the oad times, after the state had lost its Asian provinces.

The energy and the success of the esthetic intervention of western Asia ware necessary consequences of the religious prestige, which were select regions of theological speculation and of monachism (pages 33, 106). Syria imposed its conception of relief decoration; Anatolia furnished most of the rel-

religious programmes.

Byzantine architecture again drew from more distant sources. It borrowed from Sassanian Persia; from Armenia, when in the 9 th century it fell to that country to supply Byzantium with administrators, soldiers, emperors, and also architects; [1] from Mohammedan Mesopotamia, whose brilliant civilization at about the same time was revealed to the Byzantine world as a result of the intimate commercial and political relations, which this held with Baddad; [2] finally in the 13 th century with western Europe, after the "Frank" conquest had introduced some "Latin" types into the empire.

Note 1. Note the Roman emperors Lecapene, Nicephorus Phocas and John Zimisces. In 989, the dome of S. Sophia having been damaged by an earthquake, an architect named Tiridates was called from Armenia.

Note 2. The emperor Theophilus (829-842) had erected for himself a "Saracen" palace; a pavilion in the imperial gardens was termed the "Persian House". -- Note that after the 10 th century, the competition of the Persian angle trumpet with the Byzantine expedient of the pendentive. (See further, Construction).

Subjected to such numerous influences, so varied and among which are found exotics, Byzantine architecture might have b been hybrid and inorganic. What removed the danger was a preponderance of Hellenic genius, that existed from the beginning, and after the 9 th century developed that renaissance of Grecian culture previously mentioned. Thanks to it, there existed a nucleus of adhesion, a dominating energy and a point of direction.

Note further, that the work of combination was facilitated by the concentration of the vital forces of the empire at Constantinople; as a result of which there were gathered and in contact talents of varied origin, and a mutual interpenetration of provincial and foreign esthetic variations.

Indeed, it was substantially the metropolitan school, which constituted the Byzantine formula of the art of building.

IV. Radiation.

In its turn, this radiated afar, impressing both the architectural styles of the Sassanian and Mohammedan civilizations

as well as those of the Christian world; those of northern A Africa, of Syria, Anatolia and Armenia in Asia, like those of Balkan, Russian, Italian, Spanish, German and French Europe.

Chapter 3. Programmes and their Realizations.

Analysis of the programmes realized by Byzantine architecture leads to two remarks of general application:-- the arrangement of great secular buildings always proceeds from the s same principle as that of religious edifices; at first the f fashion was for oblong plans, then in a large measure for structural reasons, -- favor passed to grouped, central or radiating arrangements.

I. Municipal, Public and Military Programmes.

Byzantine architecture -- otherwise in conformity with the climatic conditions of its territory -- shared the taste of its Hellenistic and Syrian rivals for avenues and squares with single or double porticos, isolated or attached to the houses.

It understood how to ensure an abundant supply of water by means of aqueducts and cisterns; the latter were frequently colossal, and in the Alexandrine mode were covered by vaults supported by rows of columns. [1]

Note 1. There may be taken as an example the cistern in Constantinople named Bin-bir-direk; it occupied an area of 38,750 sq. ft., and its covering was supported by 212 columns.

We know that in its essential traits the Hippodrome of Constantinople reproduced the Great Circus of Rome; that the building of the University of the capital -- the Tetradision, comprised an octagon and eight porticos or vaulted halls for the races. On the contrary, we lack information of the Byzantine realization of a programme for baths; indeed they do not appear to have been comparable to the Roman.

Byzantine fortification (37) differed little from that conceived by the ancient East (Volume I, pages 120, 161, 396). It opposed to the enemy the fourfold obstacle of a wide and deep ditch; of a bank surmounted by a battlemented parapet; an outer wall; finally, an enclosure averaging about 40 ft. high, but which might attain twice that height; frequently an additional resistance was provided by redoubts, citadels and outworks. The walls were of solid masonry with battlements, provided with a passage, sometimes flanked by triangular bastions, more frequently by towers of rectangular, polygonal or circular plans, which rose above them; the internal enclosure

largely dominated the external one, and the towers of one corresponded to the curtains of the other. [2]

Note 2. The walls of Constantinople were erected by Theodosius II, were 36 ft. high and flanked by towers spaced at intervals of 164 ft; the moat was 65.6 ft. wide.

II. Domestic Programmes.

House. Palace. Monastery.

The urban type of the Byzantine house was grouped and rose two or three stories high. It often comprised a tower; nearly always on the facade were porticos, galleries, loggias, a and latticed balconies; sometimes it was crowned by a terrace or surmounted by a belvedere. In the interior, a vestibule of small depth extended the entire length or for a part of t the front; in the second story was a great central hall forming the selamlik, that often occupied the entire height of t the building and consequently was equivalent to a covered court. Around it were distributed the chambers, access to which was doubtless arranged by a gallery or balconies of wood. (83; 90). [3]

Note 3. See at Constantinople the dwelling called Tefkour Serai, which appears to date from the 13 th century; at Melnic in Macedonia, a house of the 11 th century and numerous e representations by the miniatures of manuscripts.

The Imperial Palace, in the manner of the East, presented a complex entirety of separate buildings, placed without order in a fortified enclosure decorated by gardens (89).

The state residence contained a court with porticos, a monumental vestibule, and finally a great room (triclinos) for
173 use, both as a throne and a festal hall. This was at first a basilica with three aisles, at the rear of which rose a platform, extended by an apse in which was seated the sovereign; then in the 6 th century being a hall with central or radiating plan; either an octagon, like the Chrysotriclinos of Justin II, from which on each side projected an apse supporting a gallery at the springing of its dome; or a triapsal room, such as that of the Palace of Theophilus. Besides this were one or more chapels.

The description of the Kenourgin, erected by Basil I, indicates that a harem was composed of a salon giving access at

one side to a dining room, at the other to a sleeping chamber with alcove; a dressing room, a library and an oratory. There were apartments for summer and others for winter.

The gardens were of small extent, planted with fruit and ornamental trees, carefully refreshed by fountains and streams, with kiosks and covered walks.

The Byzantine monastery was inscribed in a square of great dimensions enclosed by high walls. To their internal surfaces were attached several stories of cells, for which galleries furnished acces.. After the church, the most important stucture was the refectory, whose extremity was frequently in the form of an apse for receiving the table of the abbot.

III. Religious Programmes.

Byzantine architecture realized four types of church, an o oblong, a central, a combination of the two, and finally a radiating one.

The vogue of the first was brief and did not survive the infancy of the school; as soon as this had made its growth, it marked a taste for the second, which further was as ancient as the other; because adult, it tried the third, and finally decided for the last. Indeed its preferences were in great measure determined by the fact, that it adopted the system of the dome for the covering.

On the whole, religious programmes were in accordance with the canon required by the Christian conception of the worship. (Page 28). They were always marked by some peculiarities. T Thus they isolated the sanctuary behind an opaque screen, to which rich ornamentation by images gave the name of iconostasis (91, 7,cc). So again, the atrium was suppressed, and in compensation the narthex was extended, doubling it, adding c chapels, [1] porches, even devising proportions greater than t those of the church proper, [2] until it extended along the sides of the latter (91, 7,15,16,17,18; 94). [3] Finally, at least during the first half of the career of Byzantium, galleries were established in the side aisles, with a view of both augmenting the capacity of the edifice, and of facilitating the separation of the sexes required by the customs of the East; [1] these galleries were sometimes joined above the narthex, and were accessible by stairways placed at the ends of t

the latter (81; 85).

Note 1. See the Churches of Athos. (11 - 16 th centuries.

Note 2. See certain Churches of Athos dating from the 14 th, 15 th and 16 th centuries (Chilandari and Kastamonitou).

Note 3. See S. Apostles at Salonica.

Note 4. On the railing of that extending at the north of S. Sophia of Constantinople, an inscription marks the "place of the very noble patrician, our mistress Theodora."

1. Conceived on an oblong plan, the Byzantine church was a basilica, either with a single aisle -- this arrangement a appears to have been current in use in western Asia Minor (9 (91, 2,3) -- or with three aisles; in this case the side aisles were separated by colonnades, and were reduced in width as well as in height, lessening the height of the galleriei (91, 1,4,5). At any rate, the single or principal aisle was prolonged at the sanctuary by a semicircular apse, generally pierced by windows, and whose diameter equaled its width (91, 1,4). [2]

Note 2. As examples, we will cite Eski-djouma and S. Demetrios at Salonica; S. John Stoudion at Constantinople.

2. The central arrangement was realized in two forms; -- on the one hand -- S. George of Salonica offers a specimen-- a circular or polygonal rotunda, in the Hellenistic-Roman fashion, with the addition of an apse (91, 6); on the other, an area defined by a series of isolated supports bearing a dome and placed in the middle of a nave of rectangular plan, one of whose sides is curved as an apse. The Church of Ss. George and Bacchos at Constantinople forms a perfected application of a formula familiar to Syria and Anatolia (pages 46, 73), and whose principle remained dear to Byzantine art until the end of its career; [4] thanks to an arrangment of exedras, opened in colonnades in those sides corresponding to the angles of the external square; a central octagon is harmonized, both with the general form of the edifice and with its purpose as the nave of a sanctuary (80; 91, 8).

Note 4. See paragraph 4, the radiating plan.

3. The combination that characterizes the third division of our classification, and which appears to have obtained the favor of the men of the first half of the 6 th century, [5] con-

constituted an element of centralization with the support of a great dome on four arches above massive piers, and a factor of the oblong arrangement by filling the north and south arches by means of superposed colonnades, and by the insertion of a bay between the eastern arch and the sanctuary and between the western arch and the narthex. More complicated, that producing S. Sophia of Constantinople, accenting the central mode by choosing for the extremities of the nave a semicircular outline with exedras (81. 82; 91, 7,9,10). [1]

Note 5. See S. Sophia of Salonica, S. Irene and S. Sophia of Constantinople.

Note 1. In brief, the plan of S. Sophia of Constantinople is merely that of Ss. Sergius and Bacchos changed by extension in the direction of the main axis.

4. In the radiating plan, the part supporting the dome projects on each side of a nave with three aisles, whose area approximates its own; so that the entirety outlines a cross. From the first -- witness the S. Apostles at Constantinople [2] -- Byzantine architecture admits the projection of arms (91, 11). But from the 9 th century, these were included within a central form of rectangular shape, resulting from the insertion of parts of side aisles in the reentrant angles. Edifices like those at Constantinople, which are now the Mosques Hodja-Mustapha-djami)91, 13) and Gul-djami (91, 12), reveal the origin and progress of the type. Indeed, the first reproduced on its transverse axis the arrangement of the main axis of S. Sophia, and the second is a free translation of the composite formula to be mentioned, which in removing their g galleries from the northern and southern arches of the supports of the dome, produced a cruciform arrangement in the upper half of the church. That became the rule, even for the g ground story, dating from the renaissance of the school in t the 9 th century, [1] and it may fairly be considered as that most exbressive of Byzantine taste (91, 14,15,17,19). Note that after the 11 th century, it was frequently approximated by that of the primitive type with a semicircular outline of the northern and southern arms of the cross (91, 18; 105, 6). [2]

Note 2. See S. Marco at Venice.

Note 1. It was adopted for the "New Church" in the Palace of Basil I.

Note 2. See the Churcher of Lavra and of Vatopedi at Mt. Athos; those of S. Meteora in Thessaly; of S. Apostles at Athens; of Kalavryta; of Geraki etc.

Yet there never was a complete application of the radiating arrangement; it was opposed by the development of the narthex, which we have already mentioned, and particularly by the triple apses, which were normal from the renaissance of the 9 th century, and emphasized the orientation of the nave; so much the more because somebimes -- for example at Daphni (91, 16) -- the little apses opened into the main and not into the si-
157 de aisles. Dating from the 13 th century, there was a tendency to elongate the eastern and western arms of the cross, and even as observed in certain churches of Misitra, [1] to arrange the second in the image of the nave of a basilica. (91, 21).

Note 1. See the Metropolitan, Panagia of Brontochion and of Pantanassa.

Chapter 4. Construction.

Byzantine architecture particularly recommends itself by t the passionate attention accorded to questions of constructi- on; by the methodical and thoughtful character of its proced- ures; by the ingenuity of its methods, sometimes almost too subtle; finally by the elegance of several solutions proposed by it for some of the most difficult problems of the art of building. [2]

Note 2. If the credit contemporories, the work of S. Soph- ia was entrusted to Anthemios of Tralles "because he was the most skilful engineer of the century, and doubtless the most fertile in invention, that has ever existed". (Procopius. I. 1; Agathias. History. V. 8).

I. Materials.

The favorite material was terra cotta, that an excellent manufacture shaped into squares, tiles, or into pipes; the first measured on an average from 11.8 to 17.7 ins. on each side with a thickness of 1.58 to 2.35 ins. Marble was sought for the construction of columns, but the use of masonry of c cut stone was disliked; if stone materials were employed, th- ey were treated like bricks, split into rubble, or even into slabs (96).

It knew how to adjust itself to the limited resources in t timber offered by its domains (page 166).

Finally, enormous quantities of mortar were used; as much as possible, only lime produced by calcining marble was empl- oyed, and to give body to the mortar, to it was added pounded tiles or stone, according to the thickness assigned to it.

II. Procedures.

Wall and Portico.

In general, the construction of the wall was careful. The materials were not arranged and the thickness war considerable.

Particularly in Greece, rubble and bricks were freely asso- ciated, the courses of the latter being repeated three to fi- ve times, so as to create a strong bonding of the mass (96). Sometimes in an edifice of brick, the piers of their vaults and of the great arches bearing the dome were built in cut s stone. [1]

Note 1. See the Churches of Sardes, the Trinity of Ephesus,

the Basilica of Philadelphia, and the piers of S. Sophia.

The thickness of the beds of mortar was considerable, at least equal to that of the squares, and it frequently made t two-thirds of the composition of the structure! (96, 2).

The stone materials were also set in mortar, being otherwi-
153 se entirely without champs. When composite, the surfaces were solidly anchored to the nucleus of concrete by the penetration of transverse blocks set on edge (96, 1).

The construction absolutely proscribed the bonding of two unequally loaded parts of the masonry; in particular, the piers supporting the great arches bearing the dome or vaults were independent of the adjacent structure.

Until the 6 th century, the Byzantine school retained the tradition of the portico with architrave, as attested by the colonnades of the ground story in the Churches of S. John Stoudion and of Ss. Sergius and Bacchos in Constantinople (80). Yet it early preferred the arch resting on columns or piers.

The isolated supports of the great arches supporting the d dome were at first massive, the economy of material being limited to making their transverse section that of the imposts of the arches. A notable advance was accomplished about the 10 th century by substituting for the great pier a group of four smaller ones, even of pillars and columns, whose resistance was equal, since the width was not reduced (97).

Likewise, the form of the Byzantine column reveals both ca-
154 re in perfecting it, taste and a faculty for artificial solutions. Because of the risks of crushing and of fracture to which this member was exposed, from the fact of very heavy loads and its relative slenderness, Byzantine architecture made shift and succeded in strengthening it. At first as much as possible, they employed only monoliths set on edge. T Then against the danger of splitting the shaft, they protected it by resorting to two artifices; they banded with metal the ends of the cylinder, and to equalize the pressure, they inserted at both ends in the joints of the capital and base malleable layers of lead in sheets about 1/5 inch thick, and which the before mentioned rings prevented from squeezing out. (99, 7). Finally, to compensate for the inequality, and in many cases for the difference in the forms of the top of the

capital and the section of the impost of the arch, they utilized an expedient, that we have already observed in Syria ((page 61), that of an intermediate member, an impost block, shaped as the frustum of an inverted pyramid, at first superposed on the capital, but soon cut in the same block with it. (98; 109; 110, 3-5). [1]

Note 1. The oldest dated example (528) is presented by the Cistern of 1001 Columns at Constantinople (95).

Finally, a better adaptation of the base to its role resulted from an extension of its area, produced by the addition of a plinth, frequently reinforced at the angles by claws ((82 - 85).

The normal construction of the arches was in bricks or stone. For the latter, economy was obtained by a trapezoidal s shape like voussoirs; the greater opening of the joints next the extrados was filled by mortar, tiles, or even fragments of pottery (99, 1). The operation was frequently facilitated by the application of the system, dear to Byzantine art, of an alternation of stones and bricks (995 2-4). When an arch was constructed of the latter, those near the top were sometimes arranged with horizontal beds in wedge form (99, 5). Almost always, with a view of reducing the thrust of the arch, the curve was that of a stilted semicircular arch, and the w weight of the upper structure was relieved by arches ingeniously increasing the power of resistance. (99, 6).

One of the most characteristic traits of Byzantine construction was a constant practice on a great scale, of the system of strengthening by wooden ties, which was otherwise common in the East (volume I, page 156). It is explained by the twofold desire of preventing deformations of the structure during the periods of erection and of settlement, as well as of opposing the effects of earthquakes.

For a wall this was a series of timbers placed end to end; grillages formed by the crossing of longitudinal and transverse beams (100, 4), or again, bands of joined planks forming a layer (100, 3).

It was the rule for the side thrusts of an arch to be opposed by the effect of one or more ties, anchored in the masonry above the supports (100, 2,5,6). Sometimes precautions

were taken against the overthrow of the latter by connecting them by ties (100, 7). It again occurred that the two modes for strengthening were combined by inserting a continuous layer of planks between the capitals and the imposts of the arches (100, 1).

157 In case of the strengthening of a wall by buttresses, these were placed in the interior of the edifice (100, 8; 105, 1).[1]

Note 1. The great external abutments of S. Sophia at Constantinople (108, 1) are later additions.

III. Covering.

The construction of a Byzantine roof does not differ from that of the framework of a vessel. It comprises a series of pairs of rafters halved together and resting on the tops of the walls. These were sometimes protected against the risk of bending by a series of longitudinal purlins fixed at mid-height against their internal surfaces, as well as by cross beams, and against spreading by a tie (101).

158 Normally, Byzantine architecture covered an interior by masonry. It knew and practised all modes of vaulting and the different procedures employed in the Persian East, in Hellenistic-Roman western Asia and in the Roman West. Logically, it subordinated its choice to structural expediency. So much so, that for the same edifice, it had recourse to several systems.[1] Finally, it realized numerous and important advances in construction.

Note 1. Thus at S. Sophia of Constantinople, there were associated the spherical vault on a square plan, the hemispherical niche, the cross vault, the cross vault raised as a dome, and the tunnel vault, they were respectively employed for covering the central bay of the great nave, the extreme bays, the lower story of the side aisles, the upper story of the same, and the narthex.

We shall say nothing of the tunnel vault, because it was c constructed exactly like an arch.

On the contrary, the Byzantine formula of the cross vault in bricks merits a special mention. Indeed by raising the p profiles, instead of the intersection of two cylinders, executed with difficulty,[2] it groups four compartments in equilibrium, which abut in pairs and can retain their connections

without bonding, and whose junctions are made in an arc of a circle, conveniently traced. Each of these compartments is constructed of a series of horizontal arches, which it is possible to successively turn by the aid of a single movable centre; there results a convexity, that allies the Byzantine cross vault to that of the mediaeval West on ribs (102, 9-11).[2]

Note 2. Its stability depends on the quality of the masonry of the groins, and the diagonal curve is an ellipse.

Yet Byzantine architecture vere early indicated a preference for covering by means of brick domes, that it further applied with a rare mastery.

The curve by which the calotte was profiled varied, here r regwlar (Ss. Sergius and Bacchos at Constantinople) (103, 1), there elliptical (S. Sophia of Salonica (103, 6), S. Sophia of Constantinople and at Daphni (103, 3), elsewhere stilted (S. Apostles at Athens; Vatopedi) (103, 4).

There was likewise diversity in connecting the calotte to the support. At first -- S. Sophia of Constantinople affords an illustrious example of this -- it was placed directly on its support (103, 3); then -- S. Sophia of Salonica attests that the method was sketched from the beginning of the 6 th century (103, 6) -- a drum pierced by windows was inserted b between the two elements, and which was enlarged, until in t the 9 th century and following the evolution common to all a architectural styles, it took the form of a true central tower. (103, 4,8; 108, 2).

The construction of the Byzantine dome aimed at both reducing its weight and stiffening it. It was made very thin; materials of low density were sought, [2] and by means of various arrangements a sort of framework was realized. Sometimes, as at S. Sophia of Constantinople, there was at regular intervals a thickening of the shell by the projection of meridian b bands converging at its vertex (103, 3); sometimes -- we can cite as examples the churches of Ss. Sergius and Bacchos and of Theotokos in Constantinople -- the shell was lobed, its a angles acting like the bands just mentioned (103, 1,2). At other times, as verified in the vestibule of the Tomb of S. Demetrios at Salonica, the covering sprung from the crowns of small trumpets, otherwise termed little spherical arches --

each impost resting on the crests of two units of the lower range (103, 5,7).[3] Better Still, each ring of masonry was c
167 constructed, not by a series of independent bricks, but by a chain of curved tiles set alternating in the layers, holding together and forming inextensible and indeformable bonds (103, 9).[1]

Note 2. Bricks from Rhodes were particularly esteemed, which had one-fifth the weight of ordinary ones.

Note 3. We noted the use of this system by the constructor of the Palace of Diocletian at Spalato. Volume I, page 487.

Note 1. See the ruined Chapel of S. Pantelemon at Mt Athos.

In all modes, the lower portion of the shell -- its weak p part, and the more so because it was pierced by windows, -- was strongly girdled by a band of masonry, profiled differently from the shell (103, 1,3,4,6). Arches on engaged columns rendered the same service (103, 2).

The same ingenuity appeared in the expedients by the aid of which the Byzantines evaded the difficulty, produced in the fan-shaped masonry of a spherical niche by the excessive closeness of the beds at the bottom and their too great enlargement toward the top; sometimes the beds intersected on the m middle line of the niche (103, 11); sometimes this was divided into a central portion in which the materials abutted as in marquetry, and into a border in which they radiated (103,12).

The Church of Ss. Sergius and Bacchus at Constantinople (80; 104, 1), and the extreme bays of that of S. Sophia in the same city (81; 82; 91, 7; 104, 2) teach us, that in order to s solve the problem of the overhang, against which collided the desire to cover by a dome an interior with square plan, the Byzantines tried the Syrian-Anatolian expedient of a central octagon on arcades. The first of these edifices otherwise m manifests a notable perfection; the lobed form of the calotte permits it to rest directly on the top of the support, each recess of that receiving the curved section of one of the sixteen lobes of the latter (103; 104, 1).

But this system was soon replaced by two others; that of t the angle trumpet, which Byzantine architecture borrowed from Persia,[1] and that of the pendentive or spherical triangle, superior in every respect, whose principle was derived from the same source (page 15), but which was made its own by the

extension given to it.

Note 1. See page 15. Note the favor obtained by the angle trumpet after the 10 th century. Further, page 140, Note 2.

The Byzantine realization of the trumpet comprised several variations. Sometimes the arch was accented by an archivolt (104, 3) and sometimes not (104, 4); its form was sometimes that of a portion of a spherical vault (104, 5), sometimes t that of a portion of a cone (104, 8); in the regions of Athos and in Greece, quite frequently was that of one-half a cloister vault, divided diagonally and supported by a front arch (104, 9); or again this was a niche on a drum, whose base half projected and half receded (104, 10).

Guided by the spirit of analysis and of logic that animated it, the Byzantine school conceived the application on a great scale to the angles of the square formed by the entire interior, the system of the intersection of a sphere by a prism, which Persian art had employed on a small scale for the angles of octagons produced by the artifice of trumpets; in other words, it erected at each corner a sort of console, equivaleent to a triangular compartment cut into a spherical vault, and whose edges rested on the curved top of the walls or on the extradoses of the divergent arches (104, 13; 81). The m masonry was exactly that of the dome for which the pendentive served as support; but generally it was a portion of a larger form, so that the surface of the calotte did not continue its own, and that the springing of the covering was clearly marked (104, 11,12,16,17). Note that to adapt the expedient to the case of a rectangular plan, it sufficed to transform the horizontal curve of the pendentive in a manner to produce an oval support.

Toward the end of the Byzantine period, the pendentive ceased to be a portion of a vault, becoming a corbelled mass (1 (104, 17).

In reality, when the Byzantine constructor erected the vault in courses (page 106), he did not meet with the difficulty of corbelling in the angles. To obtain a dome, it was only necessary to build on the top of the supporting enclosure the four convex panels of the cross vault, previously defined, t taking the precaution to raise it enough to make the diagonal

arch a quadrant (102, 12-14).

The manner in which the Byzantine school protected its edifices against the destructive action of the vaults affords a measure of its rare faculties of analysis and of combination; it manifests indeed an exact appreciation of the adverse and of the favorable forces, and of the art of arranging ingenious equilibration of one by the other.

In the case of a tunnel vault, it freely resorted to the expedient of a framework in the form of transverse arches spaced apart, sustained by the internal buttresses.

If it were a cross vault, for its compartments was arranged the support of wide arches, or as observed on the side of the side aisles bordering the main aisle of S. Sophia, that of t transverse tunnel vaults (105, 1).

As for the different pressures exerted by a calotte at its entire periphery, Byzantine architecture knew early how to a attain its purpose by practical means of an elegant simplicity. Instead of wasting materials, labor and space for the e erection of massive buttresses, [2] it arranged a continuous a abutment by vaults resting against the parts of the edifice adjoining the principal dome. Then it flanked the great arches supporting the shell, either by four tunnel vaults (105, 2; 91, 9,11,12,14),-- by half domes (105, 3), by two tunnel vaults on one axis and two half domes on the other (105, 4), by three half domes and one tunnel vault (91, 13,18), or finally by tunnel vaults supported by half domes (105, 6). It sometimes completed the system by erecting four small calottes in the angles of the cross thus determined, charged with equilibrating the lateral thrusts of the supporting tunnel vaults (105, 5; 91, 15,17). Thus was ensured a concentration of the loads of the dome on the springings of its pendentives, and on the four angle piers.

Note 2. The structure of S. Sophia of Constantinople comprises two powerful buttresses in each side aisle. Each is c constructed of two parallel buttresses, one of which resists the great transverse arch supporting the calotte, and the other one half the pendentive (91, 7; 95).

Still this rational and effecient system had as an auxiliary a strengthening by rings, recommended to the Byzantine con-

constructors by their excellent service in case of seismic s shocks.

In the lower part of a tunnel vault are noted courses of timbers connected by ties (100, 8). Around a cross vault and a spherical vault on pendentives was placed a wooden frame at the level of the springing or above, which was sometimes strengthened by crossing diagonal ties (100, 9,10). Likewise for the drum of a dome; it was tied by crossed or even two or three layers of timbers, which crossed the windows and prevented deformation (100, 2).

The Byzantine roof comprised a wooden framework only in the case of a wooden roof alone. When the covering was of masonry, it directly supported the tiles, which were set in mortar.

Byzantine Methods for the Construction of Vaults without Centering.

One of the most characteristic traits of Byzantine architecture is, that being careful to economize preliminary structures, required in many places by the lack of wood, it was careful and expert in constructing the masonry of vaults over spaces without the aid of centerings in carpentry. A tunnel v vault was built by the practical method of slices (104, 1-5); if a cross vault were required, it was realized by the aid of two intersecting diagonal centres, and from both were turned arches to fill the compartments, starting from the side arches; or more simply by taking the construction by slices as f for its elementary tunnel vaults (102, 9-11).

Finally, if a dome were desired; either concentric rings w were laid up, so held externally as to prevent the risk of s slipping, and the closing was completed by a cap of concrete shaped on a platform; or better, the crown was lightly bisected from the large arches enclosing the area, and it was constructed in slices with four convex components with joined edges (102, 12-14).

Chapter 5. Effect.

The interest taken by Byzantine architecture in the work of construction did not exclude an entirely oriental passion for effect.

In truth, it was long indifferent to the external appearance of the edifice, and it particularly appreciated ornamentation, especially where color was the attraction.

I. Effects of Affective Order.

It singularly estimated -- we shall verify this in examining its conception of decoration -- the impressions of an affective order.

It disdained those produced by the appearance of material greatness. Aside from S. Sophia of Constantinople (106) [1]-- a marvel of vastness -- the elaborate religious programmes of the time of Justinian only comprised very modest dimensions, producing areas of less than 21,500 sq. ft., and the churches erected after the 10 th century are astonishing by the smallness of their proportions -- such that many of the most elegant and most famous do not cover 1080 sq. ft. [2]

1. The dimensions of S. Sophia are as follows:-- length 253 ft. width 236 ft.; clear span of dome 102 ft.; height of dome 182

Note 2. Pantocrator; 52.5 × 52.5 ft.
Eski Imaret; 36.0 × 36.0 ft.
Theotokos of S. Luke; 31.1 × 31.1 ft.
Kilisse-djami; 29.5 × 29.5 ft.
Theotokos of Salonica; 26.3 × 26.3 ft.

Note as an explanation of these small dimensions the fact, that many Byzantine sanctuaries had no other purpose than the chapels of the western churches.

On the other hand, the Byzantine school expected many advantages from an abundant and intentional lighting. In fact, a fascination resulted in the daytime from the shafts of light produced by opening numerous windows in the apexes of gables, in the curves of apses, and particularly in the walls of drums and the bases of the domes (81; 83); in the night, from a brilliant illumination of the interior by a multitude of lights, from which the immense nave took "rosy colors", according to Paul the Silent.

II. Effects of Harmonic Order.

II. Effects of Harmonic Order.

For the mind was provided the satisfaction of observing the success of the realization of the programme and its adaptation to the purpose; the elegance of the solution found for the problems of construction, the propriety of the proportions, generally regulated by arithmetical combinations and by geometrical constructions (107).

III. Effects of Monumental Relief.

The Byzantine conception of monumental relief appears quite differently, according to whether the edifices considered belong to the first phase of the activity of the school, or to the later ones.

The most beautiful churches of the 6 th century -- including that of S. Sophia of Constantinople -- externally presented the ungraceful mass of a cube surmounted at its centre by a depressed calotte (108, 1).

An evolution was commenced after the 6 th century, but its completion was delayed till the 11 th, and had Greece as its principal stage, established a model, happier because organic, indicating both the arrangement of the edifice and its construction (108, 2; 86).

Indeed, above a cubical block, announced by the ground plan, the lower story of the edifice and the elevations of the side aisles, emerged four rectangular masses in cross form and ending in ridges or rounded forms, which indicated the great tunnel vaults, and these abutted against the dome; at their intersection and revealing the central square of the nave rose a cube, surmounted by a polygonal drum crowned by a dome; sometimes in the reentrant angles formed by the crossing of the arms swelled the hemispheres of the secondary domes. From that shape resulted a slenderness, further accented by the usual decoration of the dome by the arches of the drum, and the tone of verticality arising from the angles of the latter, or against the engaged columns set around its circumference.

A parallel evolution developed in the interior both a rising charm and an appearance of vastness by the openings in the piers of the square, and even by the assignment of their functions to columns (97); by the suppression of the screens, which at first filled the great arches; by the increased neight

of the drums; thanks to this, the Byzantine churches of the second and third periods appear much larger than they really are. [1]

Note 1. To these innovations alludes Constantine Porphyrygenetos, when he insists on the "novelty" of the productions of the Byzantine renaissance after the 9 th century, boasting of their "grace, charm and elegance".

At the same time, the Byzantine school sought to emphasize the mural surfaces by a system of arcades and particularly of flat recesses, whose application was particularly happy in Greece and at Salonica (92; 108, 2).

It further derived attractive effects from a division of t the windows into two or three openings, separated by small columns (86; 89).

IV. Effect by the Relief of the Details.

The use of bricks and the passion for color conspired against seeking effect by relief of details. In comparison with its Hellenic and Roman ancestors, monumental relief sculpture as practised by the Byzantines appears mean and degenerate; its p productions are at a smaller scale. In particular, its profiles are poor, angular, frequently reduced to rudimentary variation of a chamfer; even still more simply, to an arrangement of the masonry, such as that of a course of bricks set diagonally and projecting in saw teeth.

In that respect the shape of the isolated support is significant. [2]

Note 2. For the shape of the pier, see page 153.

When it is conceived according to the Greco-Roman orders, the Byzantine capital does not comprise strong ideas. Instead of ample and elastic volutes, large, flexible and thick l leaves, it only puts forth lean scrolls, short, narrow, stiff and serrate acanthus leaves (110, 1). That sort of atrophy disfigures the imitation of the Composite Roman type exploited by the edifices of the second half of the 5 th century and those of the 6 th; it is further aggravated by unfortunate m modifications, such as replacing the crown of eggs between t the volutes by small acanthus foliage and the modeling of a thick torus at the bottom of the bell (110, 3).

Completed, the relief of the Byzantine capital excludes all

appearance of a bouquet and all expansion. The effect produced is sometimes that of the lower half of a sphere or of the frustum of an inverted cone, laterall: cut into four vertical planes (110, 5); sometimes that of a conical solid accented by plaits (110, 2); occasionally being quite simple, with that of an inverted frustum of a pyramid (110, 5). The last form is normal for the impost block (98; 109; 110, 3,4); in brief, the simplicity of structural form.

For the relief, Byzantine art resorts to work, not of sculpture, but of sunken ground and of incisions in the Syrian style (page 67), producing decorative effects, but not sculpture (page 174).

72 Effects of Ornamentation.

Indeed the latter were much preferred, and were further lavished with a liberality and in a taste, that manifests the close relationship of Byzantine esthetics with that of the East.

Effects of Materials.

The largest part was assigned in consecutive aspects to the beauty or the rarity of the materials. Stuccos executed and applied with the hand of a master; marbles split into blocks, little cubes or thin slabs, and in both cases perfectly polished; precious metals hammered into sheets; ivories, mother of pearl and fine stones, employed as incrustations; all utilizable splendor was placed under contribution for the preparation of columns, wainscotings, pavements, and the facings of vaults. Particularly, an enormous use was made of enamels in the form of paste cubes of glass colored by metallic oxides,
73 or of cubes, whose apparent surface was doubled by gold or s silver leaf beneath a thin covering of glass. Both were fixed to the structure by setting them in a stucco made of several layers of cement, whose surface was of very fine texture. The reflections from these facings and these mosaics in the case of a magnificent programme -- like that of S. Sophia of Constantinople or those of many palaces -- were fascinating, under certain lights producing the appearance of construction in luminous materials.

Effects of Polychromy.

Yet, as much if not more than magnificence, Byzantium was

passionately fond of polychromy. Of colored marbles it loved to make columns, and it freely enjoyed contrasts of colors. [1] Its marble facings were mottled marquteries producing rich harmonies, exalted by bold contrasts. [2] their effect was broad and powerful, and it was completed by the gleam of gold and by the warm and iridescent diversity of the mosaics.

Note 1. At S. Sophia of Constantinople, the columns of the ground story were of verd antique (green) marble, and those of the gallery were of red porphyry.

Note 2. For example, see the marquetries of the Basilica of Parenzo (Volume III).

The programme was modest; according to the taste prevailing after the 14 th century, it comprised the search for ornaments for the exterior of the monument, and an elementary polychromy was realized by tinting the mortar of the beds and joints of the masonry, or more simply by shading them by the artifice of sinking them behind the face of the masonry; it made use of the variety of tints of which bricks are capable, according to the material and burning; notably for arches combining alternations of bricks and stones; sometimes even incrusting with faience slabs.

Rich in strong tones, in extended scales, in simple and strong harmonies, Byzantine polychromy was singularly effective; further being controlled by a profound knowledge of esthetic requirements, by a very pure feeling for propriety, for unity of appearance and for monumental effect.

Effects of Relief Ornamentation.

The relief element of the ornamentation of a Byzantine edifice consisted in a profusion of flat sculptures, obtained by sunken grounds, engraving, cutting out, perforating or removing the material. It developed on the walls, friezes, panels and enclosures of polychrome paintings; around arches and on their soffits, ribbons and cords; on the balustrades of galleries and the surfaces of the iconostases, embroideries and openings, the whole being marvellously wrought (82; 83; 84; 109; 111).

Technics as skilful as patient, often with marvellous talent fashioned laces, trimmings, quipures and goldsmith's work in marbel or in stucco. But the result was not in proportion

to the effort. The lack of projection, excess of details, m minuteness of the work, the cold clarity of a work very often mechanical, caused an impression, frequently painful, of confusion, heaviness, monotony and dryness.

Effects by Drawing and Color.

Indeed, in the matter of decoration, Byzantine architecture preferred that, whose elements were furnished by design and color. It created varied, simple or very diversified appearances, often as happy as appropriate, by introducing into brick masonry several ways of arranging the materials (90; 92); by imposing on marbles, metals and precious materials, of which its facings were made, selected forms and by combining w with them marquetries more or less complicated; by developing frescos on the stucco on the masonry, a practice made general after the 13 th century by the diminution of resources (116); particularly by obtaining from mosaics of marbles and enamels, treated in masterly fashion, effects similar to those of paintings (81; 114; 115).

Motives.

From the beginning and still more after was developed in t the 9 th century the influence of the East, Byzantine decoration was chiefly ornamental, sustained by motives of geometrical order, such as scholls, interlacings, rosettes and stars (82; 83, 84; 109; 111; 112).

Yet it was pleased to represent flowers, birds, landscapes, genre scenes -- hunts, circus games -- and historical scenes; and these not only in secular edifices, [1] but also in churches; to the point that in the time of the proscription of images by the Iconoclasts, the temples presented the appearance of "gardens and avaries," to employ the terms of a contemporaneous critic (114).

Note 1. See the descriptions of the imperial palaces.

Yet the ornamentation of the Byzantine sanctuaries was thoroughly edifying, being regulated by ecclesiastical authority and fixed in formulas. These were two in number, the first being determined by the radiation of the types and themes adopted in Palestine in the 4 th and 5 th centuries; the second was demanded in the 11 th century by the weakening of the artistic spirit, which followed the restoration of images at t

the middle of the 9 th century.

The sacred repertory, besides symbolical figures like the lamb, dove, peacock, the throne occupied by Christ at the Last Judgment (Hetimasie), comprised images of the Saviour, the Virgin, archangels, apostles, saints, martyrs and doctors of the Church; a small number of the stories of the Old Testament (Sacrifice by Abraham, Daniel in the den of lions, the children in the furnace etc.); a cycle of episodes taken from the Evangelists, of which those most frequently treated were the Crucifixion, Resurrection, and Death of the Virgin (Dormition); finally, mystical subjects, such as the "Divine Liturgy", otherwise called the celebration of the Holy Sacrifice by Jesus, assisted by angels, etc. (115; 116).

From the 10 th century, a relation was established between the themes and the different parts of the sanctuary, which w were each provided with a mystical purpose, in accordance with the general idea, that the "church is heaven on earth". Thus the blue with golden stars and the mosaics disappeared; at the centre of the dome was a figure of the all powerful Christ (Pantocrator); lower were those of archangels forming a guard of honor, near the base being those of apostles and prophets (114); in the dome of the apse was an image of the Virgin glorified or praying; then again around the sanctuary, the mystery accomplished there was recalled by figures of the high priests of the ancient law, by representations of the L Last Supper or of the "Divine Liturgy".

Style.

The style of this ornamentation reveals the conflict of two forces; on the one hand, of Hellenic traditions, maintained by the exhibition of antique masterpieces collected at Constantinople, and confirmed by the renaissance of the 10 th century, on the other, the energetic influence of the hieratic tastes of the Church and of the orientalizing tendencies of Byzantine civilization.

According as one or the other triumphed -- from the 11 th century the second was the rule [1] -- we find reason to admire the character, expression, beauty and rythm, or to regret the impersonality, uniformity, lack of spirit and an equally disagreeable stiffness. In a general way, the dominating trait

the Byzantine ornamentation is an extreme conventionalization.
1.In the 14 th century was a tendency to revive the art by s seeking for life, picturesque and pathetic subjects.

Byzantine mural painting possessed in the highest degree t the feeling for monumental effect. As careful for the unity of the entire appearance, and the clarity of the particular aspects, for morally impressing the observer and his esthetic pleasure, it knew how to avoid minuteness in drawing, refinements in modeling, vivacity in expression, precision in perspective, and hues of color. Energetic, often almost brutal, with animated drawing, it detached the outlines and omitted details. It admitted only grave faces, rare gestures, calm attitudes and processional groups. Its palette was only charged with a small number of fresh tints, chosen from strong t tones and boldly contrasted. Particularly it watched over w what there was of gravity and discipline, order and hierarchy in the arrangement of the themes, simplicity in composition, symmetrical regularity of arrangement and harmonies of the e elements.

On the whole, it impressed on its works a stamp of noble m magnificence, sacred majesty, and also frequently of ideal s solemnity.

Book III. Eclectic Architecture of the Mohammedan Civilizations.

The domain of the Mohammedan styles of architecture is the most vast, and its career is one of the longest known to history. The former comprises all Asia, from the west of the Pamir and the Gulf of Bengal to the south of the Black Sea; from the Caspian Sea and the Sea of Aral; northern Africa from the Red Sea to the Atlantic; Spanish, Sicilian and Balkan Europe. The latter commenced at the beginning of the second t third of the 12 th century and still endures, although there has been a stagnatio for two centuries. [1]

Note 1. The works of Mohammedan architecture are still very badly known. The fault is due, both to the ruin of a multitude of its productions, and to the rarity of scientific r researches.

Chapter 1. Requirements. -- Monumental Chronology and Topography.

I. Requirements.

The vast countries, that the "holy war" gave up to the disciples of Mohammed, comprised the wealthiest and most civilized regions of the ancient world. Galvanized by the ardor of the conquerors, favored by a wise administration, they enjoyed a rare prosperity. Califs were in possession of enormous revenues and absolute power; governors were provided with an authority and with revenues almost royal; an ostentatious nobility was assured by conquest and largely endowed by the sovereigns; a citizen class was enriched by industry and commerce. Singularly active and extremely lavish in constructions. Indeed numerous as well as energetic were the causes of the demands; division of the Mohammedan area into a great number of states, whose chiefs were rivals in luxury, and often in zeal for the public welfare; the frequency of revolutions in the palaces, and of usurpations, from which resulted many creations of capitals; coexistence among orientals of a horror of inherited dwellings, of entire carelessness in the care of m maintenance, the weariness advising changes of residence; a very developed care for the tomb; the inclination of the Mohammedans for pious works (fountains, baths, caravanserais, (khans) and hospitals (moristans); finally the religious fer-

fervor, the cause of the incessant demand for ordinary mosqw- es, for catheiral or "Friday" mosques (djouma), for reliquary mosques (quoubbet), of seminaries (medresse) and of monasteries.

II. Monumental Chronology and Topography.

1. From the Hegira until the Middle of the 8 th Century.

The expansion of Islam directly benefited architecture. F Five years after the death of the prophet, the invasion of M Mesopotamia caused the founding of two cities, whose growth was necessarily rapid and fortunate; Bassora on the Euphrates and Koufa south of Babylon. (637). One of the fisst consequen- ces of the conquest of Egypt by Amrou was the creation in 641 of a new capital, Fostat, on the eastern bank of the Nile and opposite the great pyramids, and the erection at the same pl- ace in 642, of a mosque designated by the name of the conquer- or. Finally in 643, the occupation of Jerusalem occasioned the erection on the site of the Temple, of a "Mosque of the Rock" (Quoubbet-es-Sakhra).

After 660 and during three quarters of a century, architec- ture was much occupied in Syria, because Moawiah, the revolt- ed governor of the country and his descendants, the Ommiade caliphs, were both passionate for luxury and interested in p possessing in their domains a holy city in opposition to Mec- ca. It notably had a mission to construct richly decorated castles, like that of Kusejr Amra on the borders of the dese- rt and east of the Dead Sea; to make of Damascus a splendid city, endowing it with a great mosque paid for by the caliph Walid (707); to build at Jerusalem at the expense of Abd-el- Malek a mosque called El Aksa (685). These princes likewise required, the former the rebuilding of the Mosque of Medina, the latter, that of Mecca.

Finally, the submission of northern Africa to the law of Is- lam determined about 670 the foundgin of Kairouan in Tunisia, and the erection of a mosque in that city, whose name -- Sidi Okba -- commemmorates the victorious general. Sixty years la- ter was built at Tunis the Mosque Djami Zitouma. (732).

2. From the Middle of the 8 th century to the Middle of t the 9 th.

In any case, not before the middle of the 8 th century did 183 Mohammedan civilization request the services of the art of b building in the measure necessary for the progress of the fo-

former.

First, there were two wings of the Mohammedan world.

The establishment of the dynasty of the Abbassides in Mesopotamia (748) inaugurated there an age of abundant demands, varied and magnificent, whose results we are unfortunately p prevented from appreciating, by the fault of the Mongols and also because of insufficient explorations. At least we know that mad with luxury, encumbered with wealth and also endowed with artistic feeling, Mansour (754-775), Mehdi (775-785), Haroun-er-Raschid (786-809), Mamoun (812-833), Mohassin (833-841) and Motowakel (847-861) placed themselves in the front rank of building sovereigns, and that masterpieces were multiplied by the construction of two great capitals, Bagdad (757) [1] and Samarra (842); [2] splendid pacales like that of Er-Raschid at Rakka (790); mosques, such as those of Bagdad (760) and of Samarra; tanks like those of Mousa-el-Kazam at Kazamein near B Bagdad (801), and that of the empress Zobeideh in the latter city (831).

Note 1. Ruined in 1250 by Houlogou.

Note 2. Abandoned in 876.

In the same epoch and under the same impulse arose in Persia some important mosques -- Mosque Djouma at Ispahan (760-770), Mosque of Kazvine (786) -- and entire cities, like that of K Kachan, created in 800.

On the other hand in Spain, the foundation in 755 of the dynasty of the Ommiades of Andalusia opened an epoch of marvellous prosperity and of refined civilization. Thanks to the zeal of Abd-Er-Rahman I (755-655) and of Abd-Er.Rahman II (822-852), Cordova was filled with edifices, among which a g great Mosque, built from 785 to 788, was much enlarged and embellished from 833 to 848.

Finally, the erection of Maghreeb-al-Acsa or Morocco into an independent state under the dynasty of the Edressites (789) caused at the beginning of the 9 th century the creation of a capital, Fez (808), which thirty four years later was enriched by a beautiful Mosque, named Karouyin, and toward the m middle of the century, it received from Yahia-ben-Mohammed s some important embellishments.

3. From the Middle of the 9 th to the Decline of the 10 th Century.

From the middle of the 9 th century to the decline of the 10 century, Mohammedan architecture passed through a period of less activity; it felt the difficulties that the weakening of the Abbasside caliphate raised in Mesopotamia, [1] and outside Asia its field was reduced to two regions, which were in the second half of the 9 th century, Egypt, and in the 10 th, Spain and Morocco.

Note 1. Note to the credit of that epoch the erection of the Mosque of Chiraz (875) and the monuments destroyed by the Mongol invasion, at Bokhara "the Noble", which under the Samonides (875-1004) was a religious and industrial metropolis.

In the former of these countries, the successful revolt of the emir Ahmed-ibn-Touloun (869) caused the construction beside Fostat, of a royal quarter, El Katai, with a sumptuous p palace and a great Mosque (876-878). Khumaraweyh (883-896) actively continued the work by extending the programmes. [2]

Note 2. Excepting the Mosque, the monuments of El Katai w were destroyed in 905 by an Abasside army.

In Spain, Cordova under Abd-er-Rahman III became a marvellous city, the "pearl of the world" in the eyes of the semi-barbarians of Europe. Near it was produced in 936 by a caprice of the sovereign the famous "Palace of the Flower" (Medinet-es-Zahra), almost as great as a city. [1] Hakem II (961-976) c continued the work of the Great Mosque, which he enlarged by more than half and enriched by a splendid mirhab (961-965).

Note 1. It was destroyed in 1010.

In Morocco were created several cities; Sedrata (909) by t founder of a little Berber State; Makdia in Tunisia (912-918) by Abou-Obeidollah, founder of the line of the Fatimites; Algiers (944).

Finally for Sicily, conquered by the Mohammedans of Morocco during the last two-thirds of the 9 th century, the second h half of the succeeding century was an epoch of material prosperity and artistic flourising. Doubtless it is necessary to see in the Cuba and the Ziza Palaces, Arab edifices of that epoch, restored by the Normans at the middle of the 12 th century.

IV. Last Third of the 10 th century.-- 11 th century.

After the 8 th decade of the 10 th century occurred a marked

increase of the demands.

Thanks to the wise government and the artistic tastes of t the Fatimite caliphs, to whom Egypt found itself subject after 969, a great field remained open on the banks of the Nile, from that date until the decline of the 11 th century.

There came from it a new capital, El Kahira (Cairo; 969) w with a "Mosque of the Flower" (Gamia-el-azhar; 973); a magnificent Palace, a family Mausoleum, al ordered by El Moizz (d. 975), the founder of the dynasty. Then arose on account of El Aziz (975-996) a fairy Palace and a Mosque, which was founded in 990 and bears the name of the prince El Hakem (996-1021), who completed it in 1012; two Mosques, contemporary with the reign of El Mostanser (1036-1096), Talai-abou-Rezzik (begun in 1060) and El Giyouchi, the fortifications of Cairo, executed in 1060, are recalled by three grand gateways; Bab-el-Foutouh, Bab-en-Nasr and Bab-Zoueile.

On the other hand in Asia, architecture benefited by the e extension of the Fatimites into Syria -- the Great Mosque of Aleppo (976); by the impetus of the empire of the Ghaznevides in central Asia -- the Great Mosque of Ardebil in Persia (1017), and magnificent monuments of Ghazna in Afghanistan under the reign of Mahmoud I (999-1030), the great conqueror of India; finally by the fortunes of the Seldjouk Turks -- Mosque of Ani in Armenia (end of 11 th century).

Building was no more idle in Morocco by reason of a division of the country into principilaties, which required capitals -- Kalaa of Beni-Hammad (1007), a great Mosque at Algiers (1018), religious and secular edifices (famous Palace of the Pearl) at Bougie (1068); and also in consequence of the establishment of the Almoravides in Morocco -- the creation of Marrakech (1062), the embellishment of Fez (1069), and the construction of the city of Taggart at Tlemcen (end of the century).

Finally in Spain, a last extension, due to Al Mansour, possessor of the power under Hischam II (976-1002), completed the Mosque of Cordova, while there was built that of the Aljaferia at Saragossa.

5. 12 th Century.

In the course of the 12 th century, it was only in the western wing of the Mohammedan world, that architecture was the

object of rather pressing demands.

In Egypt, the fall of the Fatimite dynasty; in Syria, the establishment of the Seldjouks and the struggles against the Chusades (2 nd crusade) were not calculated to favor sumptuary demands; the undertakings of Nour-ed-Din and of Saladin w were essentially of a military type -- Citadels of Damascus, of Aleppo (1160) and of Cairo; the enclosing walls of the last city (1176).

On the account of Asia, held by the Turks, we shall mention the great Mosque of Mossoul (1150-1191); some monuments at M Merv, which was at its climax in the reign of Sultan Sandjar (1117-1157); Great Mosque and Mausoleum of Sandjar; also in the capital of the Seldjouk sultanate of Konieh, a Mosque (about 1150) and a Palace (1160-1190).

On the contrary, the impulses of the Almoravide empire in Morocco and in Spain were favorable to the art of building, whose production in those countries is marked by the fortifications of Marrakech (1107); the great Mosque of Tlemcen (1135 -1138); that of Seville (1171-1178), of which remains no more than the minaret, the famous Giralda (1194-1196); the first Alcazar of the same city (1181); the Morocco cities of Rabat and of Chella (1178); the Koutoubia of Marrakech (1184).

6. 13 th Century.

Inversely, during the first half of the 13 th century, architecture prospered only in Asia Minor and in India. In Spain, it suffered from the rapid decadence of the Moorish empire in the course of the second third of the century. [1] In Morocco, it was but little occupied -- the Kasba of Tunis and Mosque of Abou Zakaria in the same city; in Egypt not more -- Palace of Sultan El Kamil at Cairo (1218-1238). In the first half of the century, central Asia was ravaged by the Mongol invasion. Note however, some Mesopotamian buildings, at Bagdad b being the Medresse of Mostanser (1232); at Mossoul, the structures of the Atabeg Bedr-ed-din-Loulou (1218-1259).

On the contrary, the art of building profited by the economic and political impulse of the Seldjouk sultanate of Konieh and by the important theoligocal movement, of which the capital was then the theatre. In effect were demanded from it m mosques (for Konieh -- Great Mosque (1220), Mosque of Sahiba-

Sahibata or Energhe-djami (1260), of Djelal-ed-Din (1273); f for Divrigui (1228); several medresses (for Konieh -- Sirtcheli (1242), Indje-Minareli (1251), Karatai (1251); for Siwas-Gueuk Medresse (1270); fortifications -: Citadel of Konieh ((1223); finally, magnificent caravanserais -- Ak Khan at Gonjarli (1200-1250), Sultan Khan near Konieh (1229-1278).

On the other hand, the establishment at the beginning of t the 13 th century of the great Ghouride or Pathan empire in the western half of northern India opened to architecture a new and wide career, illustrated by monuments like the Mosque of Koutab at Delhi (1196-1235), that of Ajmir (1200-1235), a and the Tomb of the emperor Altamsch (died 1235) at Delhi.

Finally, in the decline of the century, Persia realized in consequence of an economic rise of the country and of conversion to Mohammedanism of the dynasty imposed upon it by the Mongols, the conditions of a resumption corresponding to the demands -- Mosque of Ghazan-Khan at Tauris (1294).

On its part, Africa did not remain inactive. Morocco was dominated after 1275 by the dynasty of the Merinides, who continued to build -- the creation of Mekines (1275), embellishment of Fez (1286) and the erection of the Mosque Sidi ben H Hassan at Tlemcen (1296).

Particularly, the fortunate condition of Egypt under the g government of Turkish mamelukes, established in 1250, enabled the sultans, as well as their emirs, to satisfy at pleasure a foolish passion for luxury and show. The remembrance of it is preserved by the ruins of the Mosque of Sultan Bibars (1267-1269); by the Moristan of Sultan Kaloun, a fine group of Hospital, Mausoleum and Mosque (1285-1293); and by a Medresse a and a Mausoleum devised for sultan El Naser (1299).

7. 14 th and 15 th Centuries.

With the 14 th century commences for Mohammedan architecture an epoch of marvellous prosperity, that must have lasted for two centuries. In the entire extent of its domain was proposed a multitude of programmes, varied and magnificent.

Under the Bahrite mamelukes, and after 1382 under those of the Cherkesse or Bordjite dynasty, especially in the two last thirds of the dynasty, Cairo was enriched by numerous edifices for various purposes, among which are distinguished; the

Mosque Nesfi Keissoun (1308); that of sultan En Nasr (1317); the Palace of the emir Bechtak (1330); the Mosque of emir El Mordani (1338-1340), the Mosque and Monastery of emir Cheikhou (1350-1355); the very remarkable one of sultan Hassan (1356-1359); the equally interesting Medresse of sultan Barkouk(1382-1399), and his very beautiful funerary Mosque in the cemetery of the caliphs. (1398-1410).

The contemporary production of Morocco and of Spain was relatively considerable. Tlemcen had become the capital of the Abd-el-Wadites and was the scene of great undertakings; the construction of Mansoureh by Yacoub-en-naser (1290-1302); Mosques of Mechouar and of Sidi-Brahim (1318), of Sidi-ben-Medine (1338) and of Sidi-el-Haloui (1353); rebuilding of Mansourah (1336-1344). There ware also works at Algiers; Minaret of Djami Kebira (1323); at Marrakech (1331); at Fez (Medresse B Bouanania (1355); and at Tunis.

As for Spain, this was the epoch in which was carried on t the realization of the Alhambra at Granada, so prosperous under the Nasride princes; the enclosing walls and Palace of Comares by Yousouf I (1333-1354); court of the Lions, Hall of Ambassadors, the Machuca quarter, by Mohammed V (1354-1391); Cabinet of the Infantes by Mohammed VII (1392-1408).

The work of Asia is no less imposing. Persia distinguished itself by monuments entirely worthy of attention -- funerary Mosque of Oldjaitou Khodabendeh at Sultanieh (1320); Mosques of Marad (1316), Veramine (1322), Amol (1378), Hamadan, Bostam and Asbistan.

The establishment of the seat of the empire of Timour (Tamerlane) at Samarcand in the decline of the century gained for architecture a new domain; Tomb of Tchouchouk Bika (1371); Mosques of Bibi-hamyn (1388-1408) and of Chah Sindeh (1392-1434), etc.

Meanwhile the art of building had yet greater reason to pride itself on the progress of Islam in India (construction of the new Delhi (Tughlaquabad, 1321); the great Mosques of Cambhay or Kambat (1325) and of Dholka (1333) in Guzerat; Mosques of Adinah at Gaur, capital of Bengal (1358-1368), of Barbak at Jaunpore (1377), of Kalan at Delhi (1387), and of Kulbarga in Deccan (2 nd half of the century).

It benefited no less by the success of the Osmanli Turks in
western Asia Minor and in the Balkan peninsula. As soon as
taken by Orkhan (1326), Broussa was provided with mosques, p
palaces and various buildings, and its embellishment continu-
ed during the course of the entire century -- Mosque and Pal-
ace of Mourad I (1357), Great Mosque (1379-1414); Baths of E
Eski-Kaplida (1389); Hospital (1394) etc. On their part, Ku-
tayen and Nicea were supplied, the former with a Mosque and
a Medresse (1378); the second with a Mosque, "Green" (1379)
etc. Finally, the conquest of Adrianople by Mourad I (1360)
introduced Mohammedan architecture into southern Europe.

During the 15 th century occurred a decadence in Morocco
and in Spain, and the efforts of Persia were mediocre -- Gre-
at Mosque of Tauris (1403-1448), Mosque of Mir Bouzourk at A
Amol and of Riza at Meched. But by the rise of Turkestan un-
der the Timourides -- Tomb of Tamerlane (Gour Emir, 1405) and
Medresse of Ouloug Bey at Samarcand, ruined monuments at Bok-
hara and at Merv; by the expansion of the Turks in western A-
sia and in Europe, the subdivision of India into numerous st-
ates competing in monumental luxury; finally, by the continu-
ance in Egypt of the favorable conditions previously mention-
ed, the Mohammedan demands were maintained at a level near t
that first noted.

Thus Cairo was enriched by a multitude of beautiful edific-
es; Mosque of El Mouiyad or El Ahmar (1414-1422); Mausoleum,
funerary Mosque and Monastery of Bars Bey (1432): monuments,
magnificent as well as numerous, were realized under the rei-
gn of Kait Bey (1468-1496), notably the funerary group (Maus-
oleum, Mosque, School, Monastery and Fountain) erected by th-
at prince (1472-1496); Tomb of Emir Yachbak (1470-1480); Mos-
ques of Esbek (1495-1500); of El Ghouri (1500) etc.

Greater was the Turkish demand, especially after the conqu-
est of Constantinople (1453). Its memory is preserved at Br-
oussa by the "Green" Mosque (1415-1424), the Tomb of Mahomet
I ("Green Turbe"; 1420): the group of Tomb, Mosque and Medres-
se of Mourad II (died 1451); at Konieh by the Mausoleum of M
Mohammed Bey (1421) and by the fortress: at Kutayeh by the M
Mosque of Yacoub Tchelebi (1433); at Adrianople by the Mosqu-
es of Mahomet I (1420), of Bokharia (1453), Eski Djami (1468),

Bayazid (1484), by caravanserais and fortifications (1497-1500); at constantinople by the Mosques of Eyoub, of Mahomet II (1463), Daoud Pacha (1484), Bayazid (1497-1504), the Old Seraglio and the Baths of Mahomet II etc.

Finally, India did not remain behind, thanks to the undertakings, frequently magnificent, op the sovereigns of Jaunpore-- Mosque of Atala (completed in 1408), Great Mosque (1438-1478) in the capital of the same name in their state; those of Malwa, whose capital, Mandu, was founded in 1401, and was rapidly enriched by palaces and mosques (the most important being finished in 1434); of the princes of Bengal, who multiplied at Gaur and at Malda useful and sumptuary works (1414-1445); of the masters of Guzerat -- construction of Ahmedabad (after 1411), funerary monuments of Sarkheje (1446-1451), Tomb of M Mabarak Sayyd near Mahmudabad (1484), Great Mosque of Champanir (southwest of Ahmedabad) (1484-1508), Mosque of Munafiz Khan at Ahmedabad (1492), Mosque of the Queen at Mirzapore; of the Bahmani dynasty in Deccan, which transferred its capital from Kalberga to Bidar (1426), where it was lavish with splendid edifices (Medresse of Mahmoud Garvan, completed in 1480).

8. First half of 16 th Century.

During about fifty years, corresponding to the first half of the 16 th century, this fever for building appears to have subsided.

The conquest of Egypt by the Turks (1518) caused the loss of one of itr best patrons to Mohammedan architecture.

Disturbed by the invarion of "Mongol" bands, who under the lead of Baber founded the Mogul empire, or that of the Grand Moguls at the expense of the Pathan dynasty (1526), southern India figures in our representation by only a small number of monuments' the Mosque of the Citadel of Delhi (1541); Tomb of Sher Shah (died 1545) at Sansaram etc.

In Persia the work of national reconstruction, commenced by Ismael Sefi (1501-1523) could scarcely comprise sumptuary enterprises. For this time, we can only cite the construction at Ardebil of the Mosque of Sheik Sefi and of the Palace of Osman Khan.

The Turkish demand alone continued relatively important, m

maintained by the spirit of conquest and the zeal of Bajazet II (1481-1512), of Selim I (1512-1520), and of Siliman II the Magnificent (1520-1566); witness at Constantinople the Mosques of Shah-Zaden (completed in 1545), of Selim I (1520-1556), and of Roustem Pasha; at Scutari, that of Inkelessi Buyuk; at Angora, those of Hadj-Beiram and of Ahmed Pasha; at Broussa, the Baths of Yeni Kaplidja; at Konien, the Fountain of sultan Selim (1520), at Siwas, the Tomb of Bayezid; at Damascus the Sulemie Hospital and Monastery (1515), at Jerusalem, fortifications (Gate of Damascus; 1537) etc.

9. Second Half of the 16 th Century and First two-thirds of the 17 th.

The middle of the 16 th century and the decline of the 17 th limit one of the brilliant phases of the history of Mohammedan architectural styles, otherwise peculiar to the Ottoman empire, Peesia and the India of the Great Moguls.

Always persistent, the first multiplied edifices for all p purposes on the account of sultans, pashas and citizens. Among them we name; at Constantinople; the Mosques Sulemanie ((1577), of Ahmed I (1609-1614), of Sultana Valide (Yeni Djami; 1650), Turbe of Selim II, the Valide Khan (1650), the New Seraglio (1644) etc.; at Scutari, the Mosques of Ayasma, of Djahanguir (1568), Valide Djami (1650) etc.' at Adrianople, the Mosques Sulemanie (1570) and of Mourad IV (1628)' at Nigde in Asia Minor, the Tomb and Mosque of Fatma Khatoun, daughter of Ahmed I (1619); at Bagdad, the Mosque of Sheik Omar (1663) etc.

In Persia, the accession of Shah Abbas I (1585-1628) inaugurated an epoch of magnificent prosperity for the country in general and for architecture in particular. Tauris and Kazvine were raised from their ruins. Ispahan was chosen as capital, and was decorated by one of the most beautiful monumental arrangements in the world; a vast square bounded by a great mosque and by bazaars -- the Meidan-i-Shah, different edifices and admirable promenades -- alleys and pavilions of T Tchar Bey. Let us cite further sumptuous palaces, such as t that of Ali-Kapou at Ispahan (end of the 16 th century); that of Achref in the Mazenderan (1613-1627). In 1647, Ispahan w was enriched by a beautiful Mosque named Loutif Cullah; in 1 1666 by a monumental Bridge, called Rokn-ed-din.

Also for Turkestan, the end of the 16 th century and the b beginning of the 17 th were a time of prosperity and of embellishment; witness at Samarcand on the market-place (Regnistan), the Mosques of Schir-Dar (1616) and of Tilla Kari (1618); at Bokhara, mosques and medresses.

In no country and in no epoch was Mohammedan architecture more favored, than in the India of the Great Moguls from the middle of the 16 th century to the decline of the 17 th.

Akbar the Great, whose long reign (1556-1605) was one of t the best recorded in history, had in a rare degree the taste for building and a passion for the beautiful. The measure of both is given by a Tomb of the emperor Humayun at Delhi (beginning of the reign); by a multitude of edifices at Agra, in the number of which are notably the Old or Red Palace; by splendid monuments at Fathpur Sikri, the favorite residence of the sovereign -- among which is one of the most beautiful Mosques of India (completed in 1575); by a citadel and Palace at Ahmedabad (1572); by the Tomb of the prince at Sikandam etc.

Under Jehangir (1605-1628) the demand was less -- Palace a and Tomb of Itamad-d-Daulah at Agra; Palace of Lahore; new c city of Dacca in Bengal. But thanks to Shah Jehan (1628-1 1658), one of the most enthusiastic builders, that ever existed, it became more beautiful; great palaces at Agra (1638-1645) and at Delhi; mosques at Agra -- "Mosque of the Pearl" or Moti Musjid (1645-1653); at Delhi -- Cathedral Mosque (1644-1658), Mosque of Jehan Ara Begam (1644-1648); Tomb of the empress Momntaz at Agra -- the famous Taj Mahal, one of the masterpieces of funerary architecture (1630-1647).

Yet this magnificent effort should not eclipse that of the princes of Golconda, recalled by remarkable mausoleums erected at the beginning of the 17 th century, still less that of Ali-Adil-shah and of his successors on the throne of Bijapore, attested by a great Mosque (1557-1579), numerous palaces and mansions (Gagan Mahall; 1651), monumental tombs, like those of Ibrahim II (1579-1626), of Mahmoud (1626-1660) etc.

For the same epoch, we have said that the production of the remainder of the Mohammedan world was very small. Egypt contributed to this by the erection at Cairo of the Tomb and Medresse of El Ghouri (1501), of the pretty Mosque of El Bordeini

(1628) and that of Ibrahim Aga (1652); Morocco, by the construction at Tunis of the Abdelliah (1523) and of the Mosque of Hamoud Pasha (1631-1664), at Algiers, the Palace of Janina ((1634), of theMosque of the Fishery (1660), various monuments at Marrakech -- Palece El Bedi etc.

10. From the Decline of the 17 th century.

From the decline of the 17 th century, the Mohammedan world built less and less.

In the Ottoman countries, the demands were scattered and d diminished in importance. Note the erection at Adrianople of a Palace (1676); at Constantinople a New Seraglio (1669), Palace of Sweet Waters of Europe (1718), new Palace of Unkiar S Skelessi (1748); rare Mosques -- Nour-i-Osmanie (1748-1755); of an aqueduct under Mahmoud I etc.

Under Aurengzebe (1658-1707), the Mohammedan architetcure of India shared the decadence of the Mogul empire; yet Mosques at Benares (1669), at Lahore (1674), and Palaces at Delhi attest that it was not inactive.

Persia likewise, after Shah Abbas, passed through difficult times, felt by art. There was a resumed demand three times; under Shah Hussein (1694-1721) -- Medresse and Caravanserai Madere-i-Shah Hussein at Ispahan (finished in 1710), new Pavilion of Tchebel Soutoun (1700); under the usurper Kurde Kerim Khan (died 1779), whose installation at Shiraz in 1755 occasioned great ornamentation of that city -- Mosque Vekil; f finally under Feth Ali (1797-1834), who built at Ispahan -- Pavilion of Eight Paradises (Hecht Behicht), as well as at T Teheran, the new capital -- a great pleasure Palace called Kasri-i-Kadjar.

As for Egypt and Morocco, their contribution to the monumental treasures of Islam was very small. Yet we may cite; at Cairo, the Monastery yamed Tekki-ye-es-Soultan Mahmoud or Habbaniye (1751) and the beautiful Fountain of Sebil-Abd-er-Rahman (1759); at Algiers, the Mosque Sidi-Abd-er-Rahm (1697); at Tunis, that of Sidi Mahrez (1700), at Mekines, the Gate Babel-Mansour-el-Heuldj (1732) etc.

Chapter 2. Conditions and Influences. -- Schools.-- Epochs. -- Radiation.

I. Conditions and Influences.

For a long time no Mohammedan architecture existed, except in the sense that the art of the different peoples conquered by the Arabs was compelled to adapt itself to the religion, customs and tastes of the victors. In fact, since these only numbered missionaries and soldiers in their ranks, they were obliged to employ native artists, whether converted or not.[1]

Note 1. Note the tradition which attributes the construction of the Caaba at Mecca to a Copt from Alexandria, and that of the Mosques of Amrou and of Ibn Touloun at Cairo, which do equal honor to the Christians. Ibn Khaldoun writes:-- "When the Arabs had ceased to observe the strict precepts of their religion, and when the taste for a happy life and for power had seized on them, they learned from the subjugated Persians the arts and architecture". (prologomenes).

Yet it was fated, that this submission should prepare the coming of a certain esthetic fellowship among the different sections of the Mohammedan world.

And first, each one was stamped with the same mental and m moral imprint, so strongly that after receiving this, the most widely separated peoples, the most different races, and t the most unequal civilizations found themselves related.

Besides, though not refined, the Arab leaders of the conquest -- the employers of architecture -- were not barbarians; generally being well endowed in respect to esthetics, they largely belonged to sedentary tribes, for which building was not a nowelty.[1] Thus they had preferences, whose satisfaction was everywhere marked by the same trait of native art.

Note 1. See before, Book II, Part II, Section I.

A third cause of the formation of a Mohammedan style was t the extreme facility of communication between the Mohammedan countries. It resulted from the convenience of journeys, that created a great religious and social fraternity; from the existence of a common language and from official and private arrangements in favor of travelers; finally, from an intense commercial circulation, favorable to make common the decorative forms created by the sumptuary arts.

We must again regard as favorable to a relationship of the schools, the power and despotism of the sovereigns, that permitted them to either call from afar architects and artisans, [1] or even to levy them in multitudes. [2]

Note 1. For example, note the construction of the mosques of Cairo by Persian architects, one in the decline of the 10 th century on account of a wife of the caliph El Moizz; another, that of Nefsi Keisoum (1308) by a master from Tauris, who, according to Makrisi, copied the minarets of the Mosque of A Ali-Shah in that city. Note the invitation addressed by Baber and by the Great Moguls of the 17 th century to architects of Constantinople.

Note 2. Note the Egyptian and Persian decorators, that sultan Selim II levied by hundreds for the works at Constantinople; also note the multitudes of artisans of all nationalities -- including Chinese -- that Tamerlane concentrated in Turkestan.

[illegible] Finally must be counted as an agent of unification the prestige of Bagdad, the seat of the Abbasside caliphate, and of Damascus, capital of the Ommiade caliphate; for this subjection of the Mohammedan world to the radiation from the Perso-Mesopotamian and Syrian East. In particular, the Sassanian ornamental style was made universal by an active exportation of the products of the artistic industries of Persia. [1] It is true that in Mediterranean countries, there was competition by the Byzantine formula, that benefited by an already ancient vogue and by the fame of the mosaicists of Constantinople. [2]

Note 1. See page 205. Note 1. Likewise note the prestige of the Palce of Chosroes at Ctesiphon, an idea of which is g given by the fact, that when sultan Hassan projected a mosque in Cairo (1356), he caused the height of the monument to be measured in order that his own should exceed this.

Note 2. See the entirely Byzantine sculpture of the Mosques of Jerusalem, Damascus, Kairwan etc. The mosaics of these two first cities were the work of Byzantine artisans; likewise those of the Mosque of Cordova, for the execution of which Hakem II ordered from Constantinople 320 quintals of cubes. (961).

Let us add that the comparative unity of the Mohammedan wo-

world in regard to climate facilitated the transmission of p programmes and methods from one country to another. [3]

Note 3. For the natural conditions that Mohammedan architecture found in the different provinces of its area, we ask the reader to refer to the Chapters devoted to the earlier m manifestations of artistic activity in those countries. (See Volume I, pages 25, 117, 156, 256 and 392, and in this Volume, pages 36, 70 and 294).

Certainly Mohammedan art must have been affected by the ordinary conservatism of the East, confirmed by the Mohammedan spirit, a strictly corporate organization of trades, and an ultra traditional instruction.

Yet, thanks to the impulse of progress, that produced a profusion of frequently magnificent demands, of enormous material resources, and finally the qualities of artists and of artisans inheriting the taste and experience of some of the most artistic civilizations of the world, there was accomplished in each of the great regions of the Mohammedan world a slow ripening, at the end of which blossomed a composite style, but animated, characteristic and rich in beauty.

Then in the largest measure, the development and the orientation of Mohammedan architecture found themselves dependent on conditions of the human order. To those just recognized by us it is proper to add the passion for effect, particularly in a brilliant key, which constitutes one of the characteristics of the oriental; his negligence and carelessness; his habit of only building temporary dwellings, confirmed by the fact of equal suddenness of fortune and of disgrace, peculiar to democratic societies under despotic government; finally, the requirements of sovereigns accustomed to the rapid satisfaction of their caprices.

II. Schools. -- Epochs.

In the relative unity of Cohammedan styles of architecture may be distinguished six great schools, which may be placed in two groups, each dominated by the one first mentioned:-- on the one hand being the Syrian, Egyptian, Morocco-Spanish; on the other being the Perso-Mesopotamian, Seldjouk-Ottoman-Turkish and the Indian.

The school of Syria cannot be appreciated at its value, be-

because its work for the greater part was destroyed by the r ravages of the Crusades, Turkish and Mongol invasions and the campaigns of the Mameluke sultans of Egypt, and what remains has not been studied as it merits.

Faithful to its ideal of the pagan and Christian epochs, [1] it applied itself to good construction, and preferred effect by monumental relief and polychromy of materials. It very energetically influenced Egyptian architecture after the 12 th century; that of Turkish Asia Minor in the 12 th and 13 th; in lesser measure that of Morocco before the 11 th, and that of the Ottomans in the 16 th.

Note 1. See Volume I, page 447; Volume II, page 48, 56.

On its part, it was affected by Egyptian art, at least in the details, in the 11 th century and in the 14 th and 15 th; by that of western Europe as a result of the Crusades. [1]

Note 1. See the minaret of the White Mosque at Ramleh (Palestine), called Tower of Forty Martyrs. (1318).

Not before the 15 th century did the Egyptian school attain maturity. At first, it drew from Coptic, Byzantine, Syrian and Perso-Mesopotamian sources, [2] using brick construction a and decoration by stucco and paintings. In the last year of the 12 th century, the establishment of the dynasty of the Ayoubites, originally from Syria, subjected Egypt to the artistic influence of that country; its progress was manifested in the course of the succeeding centuries by a development of stone construction, [3] and by an embellishment by means of methods of mounmental relief and of structural polychromy. In the decline of the 13 th century and in the 14 th, were added Persian influences, favored by the Asian origin of the Mamelukes; these are revealed by the adoption of a cruciform plan for the mosques and by the use of faience mosaics. In the 14 th and 15 th centuries was created a very remarkable formula, whose application was particularly happy in the domain of domestic architecture. After the 16 th century, it is complicated by some Ottoman elements, introduced with the Turkish supremacy. Inversely, Egyptian art contributed to the formation of Ottoman art.

Note 2. Note the fact, that the Mosque of Ibn Touloun at Cairo (876-878) was imitated from that of Samarra. Also that

being Shiites, the Fatimides must have had a weakness for the art of Persia, the cradle of their faith.

Note 3. The most ancient facade in stone is that of the M Mosque El Akmar. (1125).

Two schools disputed the control of Moroccan and Spanish a architecture, those of Kairuan and of Cordova.

The former, that until the 12 th century radiated over all Morocco and also over Sicily, proceeded in very large measure from Africo-Byzantine art and that of Mohammedan Asia. [1]

Note 1. Ibrahim-el-Aglab, the first Aglabite sovereign of Kairouan, imported from Bagdad faience tiles for the decoration of the Mosque of Sidi Okba.

206 After the 10 th century and particularly the 11 th, this d dependance was reduced by a reaction of the Berber oasis of the inhabitants of northern Africa. [1]

Note 1. Note the manifestation of this reaction in the political domain, the foundation of the states of Sedrata, of Kalaa, of the Beni-Hammad etc.

For its own part and the same reason, the school of Cordova found itself in the 12 th century freed from Asian influences, and it developed a peculiar and charming style, whose flowering was completed in the 14 th and 15 th centuries. From the 12 th century it prevailed in Morocco and Tlemcen, the emigration of the Moors, driven from Spain by the Christian "reconquest", introduced it throughout all northern Africa, where the native architecture still declares itself as "Andalusian".

The artistic history of the Persian middle ages is imperfectly known; it is probable that the disturbances and invasions, that for centuries desolated Persia, opposed the architectural expression of its genius, whose vitality was attested by an important literary production.

With regard to art, Mohammedan Mesopotamia remained Sassanian; [2] it even drew from the Babylonian and Assyrian stocks as attested by the ziggurat forms of the minarets of its mosques. [3]

Note 2. For example, note the arrangement of the great halls covered by tunnel vaults and opening on a court, presented by an Abasside edifice (9 th century) at Dar El-Khalif. (Left bank of the Tigris, 3.1 miles north of Samarra).

Note 3. See those of Samorra and of Aboudolaf. Also see page 234 and Fig. 151.

Likewise in Persia, where traditionalism is emphasized in the affiliation connecting the "talar" of the dwellings to the apadana of the Achemenide epoch, the "liwan" of the mosques to Sassanian halls, and the ordinary method of covering to t that of the Palaces of Firouzabad and of Sarvistan. (Volume I, page 394; Volume II, pages 6, 12).

The opening of the Persian style was delayed until the end of the 16 th century; it then realized a brilliant formula, which combines grandeur of conception, taste in composition, science in execution, and an exquisite feeling for effect.

Its radiation was as energetic as extensive. (Pages 223, 225). Besides the art of Egypt and of Morocco, previously m mentioned, it strongly affected that of the Seldjouk and Ottoman civilizations, and impressed on that of Mohammedan India its definitive orientation. In truth, Persian architecture borrowed some things from the latter; in the Turkestan portion of its area, it admits some elements of Chinese origin, [1] and perhaps had some obligations to Armenian construction. ((Pages 241, 243, Note 2).

The development of the Turkish school passed through two phases; in Anatolia in the service of the Seldjouk civilization, it grew under the triple influence of Armenia, Persia a and Syria. After the establishment of the Ottomans in Europe, it followed the course of Byzantine architecture. [2] But by various innovations, some of which had great consequences, and by the introduction of modes of Syrian, Egyptian and Persian decoration, it created an art, remarkable, rational, scientific and monumental, which was strongest in the 16 th and 17 th centuries. [3] The fame of the great sultans of the 16 th a and 17 th centuries aided it to contribute to the ripening of that of India. [1] Its career was interrupted in the 18 th century by an invasion of European taste.

Note 2. Indeed, many great Ottoman architects belonged to the conquered peoples. Thus the author of the Mosque of Mahomet II at Constantinople and that of the Yechil Djami at Broussa were Greeks; respectively being Christodoulos and Ilias -- Ali Sinan, the most illustrious of the masters of the sch-

school, and Khair-ed-din, the creator of the Bayazidie, were Albanians.

Note 3. Ottoman architecture owes much to Sinan. By erecting masterpieces like the Sulemanie of Constantinople and t the Selimie of Adrianople; by furnishing plans for 307 edifices for all purposes, he multiplied models of science and taste; finally, his numerous pupils remained faithful to his p principles, which they exported, even into India.

Note 1. Architects were requested from Soliman by the emperor Baber; from Mahomet IV by Shah Jehan. Several pupils of Sinan were in the service of the Great Moguls.

Until the end of the 13 th century, the Mohammedan architecture of India was only distinguished from the native style by the details. [2] Then Persian influences exerted themselves at the expense of the ornamental exuberances of Hindoo genius. Their development was partly consecutive to the foundation of the Mogul empire, and doubtless to the intervention of Ottoman architects, but led at the middle of the 16 th century to the formation of a style, admirable in many respects, a combination of Persian grandeur and of Hindoo fantasy. At first stamped with power and originality, after the second third of the 17 th century, it inclined to elegance, to finally fall into trickery. (Book V; Part I).

Mohammedan India exported to Persia the type of bulbous dome and also the ogee arch, which it derived from Buddhist and Brahmin India. (Pages 316, 324).

III. Radiation.

The extension of Mohammedan architecture beyond the borders of Islam was mediocre. Still, note its effect on the school of Byzantium in the 9 th century (page 140), and on those of Armenia, Russia, Servia and Moldavia-Wallachia (pages 64, 261, 267, 268, 273, 276, 279, 282); the persistence of the Moroccan style in Sicily under the Norman supremacy and its extension into southern Italy; the survival of Andalusian art after the destruction of the Moorish states; finally, a strong influence on the Christian art of the West.

Chapter 8. Programmes and their Realizations.

I. Secular, Military and Funerary Programmes.

Except in the matter of hydraulics, Mohammedan architecture distinguished itself little in works of public utility, and for fortifications limited itself to copying the Byzantines.

However, note the grand and practical simplicity of its conception of the caravanserai; a great rectangular court -- sometimes a vast covered hall -- with fountain and basin at its centre, surrounded by stables and storerooms in the ground s story, with chambers in the second, reached by a gallery.

On the other hand, it derives honor from its elaboration of domestic programmes.

Required by the customs of the East, it jealously protects the interior from curiosity, and ensures a strict separation of social and family life. On the one hand, it distributes the rooms around one or more courts; raises facades with as few openings as possible; places over the windows the mask of a close lattice; reduces the means of access to a narrow doorway and a corridor, generally crooked. On the other, it divides the dwelling into two very distinct parts; one, the selamlik, being open to visits; the other, the harem, being secluded.

It understood how to accommodate the arrangement to the conditions of a hot climate and to render the habitation pleasant. In the city, space was gained on the street by the expedients of stories corbelled out and of trellised enclosures on balconies called mushrabiyes (143); porticos and galleries placed around the court, providing access at the same time as sheltering the chambers from excess of light and heat, permitting living in the air; the roofs were arranged in terraces for taking the fresh air, an equipment with baths was the rule, often more luxurious than the apartments; the salon (liwan) was a great room opening for its entire width on a court or another lower hall, refreshed and enlivened by a basin, a and by fountains for the rich (120; 138, 8; (1,4,5); 4).

For a palace or a pleasure chateau, the principle of arrangement is the same, only that the elements of the residence are scattered throughout the extent of a great garden.

The throne and audience halls (divan) occupy one of the si-

sides of a court, generally bordered by porticos and decorated by basins and beds of flowers (133, 2 (4,6); 134; 166); in Persia -- where they are called "talars" -- and in India -- direct descendants of the Achemenide apadana [1] -- these are pavilions composed of an open columnar hall and an apartment in the rear; awnings, hung in the intercolumniations and obliquely before the facades, protect them from the heat of the sun (133, 2 (6); 125).

Note 1. Volume I, page 394.

The living rooms, kitchens, storerooms and offices extend along the sides of the courts (133, 2; (9, 10); here and there open [2] or enclosed [3] kiosks provide places for repose (125; 126; 133, 1,4).

Note 2. See Pavilion of Mirrors at Ispahan (125; 133, 1); pavilion in stories in the Palace of Akbar at Fathpur Sikri. (126).

Note 3. See the Ziza and the Cuba at Palermo (133, 4); the Tchinte kiosk in the Old Seraglio at Constantinople.

In its elementary form, the Mohammedan tomb is reduced to a stele, more or less sculptured. For a deceased man of rank, a mausoleum, canopy or chapel is erected in the midst of a g garden, if possible. Its proportions may attain to those of a great monument, particularly in Egypt, Persia, Turkestan or Turkey, and especially in India, where to cite only two or t three examples among many, the Tomb of Humayun near Delhi (1 (135), that of Akbar at Sikandara, of Mohammed at Bijapore, and particularly tha Taj Mahal at Agra (127; 128; 166), which rival the most magnificent secular or religious edifices.

At Cairo, the funerary programme for a prince comprises a mosque, fountain, elementary school, frequently a seminary a and sometimes a monastery (137, 10; 148). The separation of the sexes is maintained as in life.

II. Religious Programmes.

Mohammedan worship required a sacred enclosure; a shelter for the faithful; a basin for ablutions, an indication (kibla) of the direction of Mecca, so that the person praying could turn toward the holy city; the means for the clergy to proceed to the reading of the Koran on the one hand, and on the o other to call the people to prayer.

These were satisfied by a programme (137, 1) comprising the realization of a rectangular enclosere (haram) orientated by its longer sides; the abutting of porticos (liwan) against t the four walls (137, 2), open towards a court (sahn; 137, 1), at the centre of which a canopy sheltered a fountain (midha; 137, 4); the arrangement of a service court with basin and latrines (137, 9); giving to the portico of the "liwan" on t the side next the holy city a greater depth, and assigning to it the role of a hall (137, 1(3); 139), the placing on its r rear wall of a sort of indication (mirhab) of the direction of Mecca (123; 136; 137, 1 (5)), at first in the form of a f false doorway, and later that of a niche; the erection in the vicinity and at its right hand, of an elevated pulpit (mimbar) for the imam (136; 137; 1 (6)) and of a platform (dekke) for the moballigh, charged with reproducing for the distant believers the acts of the imam and of "making them come to prayer"; (137, 1(7); 145); finally, the construction of a tower (minaret) accessible by the muezzin, charged with calling believers to prayer (118; 119; 137, 1 (8); 138; 148; 151).

This plan offers the advantage of being extended at will, either by the elongation of the oriental liwan, or by the multiplication of its bays, [1] evidently derived from that of the Semite temple (Volume I, pages 161, 166); it further recalls that of the Christian basilica with an atrium (page 27).

Note 1. Note the successive enlargements of the Mosque at Cordovo (139).

A variant, whose vogue commenced about the 12 th century is distinguished by a mode of exalting the diggity of the mirhab. The means is simply the enlargement of the aisle leading to it (137, 2,4), or by the formation of a sanctuary by assigning a greater width to the last bay of the portico (137, 2), or rather by suppressing a portion of the isolated columns b before the sacred niche. (137, 3). The space provided by this operation is sometimes isolated by a barrier (maksoura), reserving it for the prince (136; 137, 5). [1] Besides the Moroccan-Spanish school freely gives to the mirhab the dimensions of a small circular chapel, accented externally by a dome; the entrance is marked in the same fashion and also by a doorway (137, 3,5). [2]

Note 1. See the Mosques of Cordova, Mansoura-Tlemcen, Kulbarga and of Fathpur Sikri.

Note 2. See also at Cairo the Mosques El Azhar and El Hakem.

Under the influence of Byzantine art, the Ottoman school replaced the portico of the mihrab by a nave, as open as possible, whose capacity was sometimes increased by the arrangement of galleries (122; 137,6; 145). Rarely -- the Green Mosques of Nicea and Broussa present examples -- it gave this a vestibule, equivalent to the Christian narthex. Often on the contrary, it complicated this by various annexes for use as library, seminary, hospital and caravanserai.

A second type of mosque -- of Persian origin[3]-- substituted for the four porticos just mentioned as many great naves arranged in cross form. These are open (137, 7,10); others are preceded by a columnar porch, open for its entire width and height (137, 5; 158). Sometimes the vast court being retained, these occupy the middle of each side and are connected by galleries (137, 7,8); [4] sometimes a reduction of the area open to the sky makes them almost adjacent (137, 10); [5] finally, sometimes a covering of the central area realizes the unity of an edifice on a central and radiating plan (137, 9); [6] This is as if the principle of the Semite haram had been supplemented by that of the Christian church. Yet the Persian formula of the mosque appeared to be native and traditional in what recalls the arrangement of the Sassanian palaces, the great open hall of Firouz-Abad and of Ctesiphon, the audience hall with monumental vestibule at Sarvistan, and the cruciform plan of the propyleum of Rabbat-Ammon (6; 63).

Note 3. That was imported from Egypt in the 12 th century.

Note 4. See the Djouma Mosque of Ispahan.

Note 5. See the Mosques of Hassan, Esbek, and of Kait Bey at Cairo.

Note 6. See the "Blue"Mosque of Tauris and the "Green"Mosque at Broussa.

For commemorative mosques or those for women, a circular or polygonal outline was common (137, 11) [8]

Note 8. See the Kubbet-es-Sakhra at Jerusalem.

As for seminaries or medresses, the Persian arrangement was applied to them, when the religious instruction treated of the

four orthodox rites, [1] and it was suitable to arrange as many separate rooms (137, 10; (13, 13, 13, 13)).

Note 1. Malekite, Chafeite, Hanbolite and Hanefite.

Chapter 4. Construction.

Mohammedan construction calls for different appreciations, according to whether it is considered in the realization of a domestic programme or in the service of monumental architecture. In the former case, for reasons previously indicated, (pages 181, 203), it appears premature and careless of stability; in the latter, it manifests as much science as care, and some of its methods have done it great honor.

I. Materials.

In a general way, it employed very little wood, because the greater portion of its area was poor in trees, and much clay, because of the economy of time and of skilled labor permitted by that material.

It utilized this, either tamped into forms or moulded into crude or burned squares. The use of bricks was constant in Persia and Mesopotamia, dominant in Turkey, common in Morocco and India, and general in Egypt, from the 7 th to the 13 th century. Concrete was equally usual, the same with gypsum, which the Andalusian school loved to excess.

As for stone, it always possessed in the form of rubble or of cut stone -- favor in Syria and Anatolia; after the 12 th century, it began to gain that of Egypt, which it entirely
220 obtained from the 14 th; in Turkey, it competed with brick, which it finally supplanted in India.

II. Methods.

Mohammedan carpentry and particularly joinery afford proof of extreme skill. The Andalusian school is characterized by the art with which it substitutes for great timbers boxes covered with plaster or not, and it erected economically the f framework of a plaster structure (140, 1).

Admirable likewise were Mohammedan lattices, whose construction by halving thin pieces is appropriate for hot countries, in which wood is subject to shrinkage.

221 Wall.

Construction in tamped earth or concrete was often strengthened by courses of tiles or beds of concrete, as well as by vertical bands of bricks. That of bricks was joined by thick layers of mortar.

As for stone masonry, Syria, Egypt and India present admir-

admirable specimens.

Nothing is perhaps more characteristic of Mohammedan construction, than its taste for corbelling and skill in its use.[1]

Note 1. For what concerns stalactites, see page 238.

The ordinary shape of the openings was arched (141). The windows were frequently coupled with a little column or pillar between them, being closed by a perforated screen in plaster or stone (157; 161), or by lattices of wood (143), and after the 15 th century were glazed with bits of glass set in the perforations of a plaster panel (161), or assembled in s stained glass windows (162).

Portico.

As an isolated support, Mohammedan architecture freely made sacrifices to elegance and preferred the column to the pier; so much the more, because for a long time it found them at p pleasure already shaped in Grecian, Roman or Byzantine edifices. It obtained the support necessary for the imposts of arches, either by the Byzantine expedient of an impost block ; (139; 153, 1); or -- as the fashion in Spain -- by placing t two or even more columns close together (120; 193, 4).

The Mohammedan portico is an arcade.

The pointed arch was usual in Persia from the 8 th century;[3] in Spain and Egypt after the 9 th;[4] in Turkish countries at all epochs (119; 122; 145); in India after the conquest. In the first of these countries, it was low and could be inscribed within a semicircle, by reason of the almost constant flattening of its upper half (138; 141; 5,6; 159), in the second, it was very obtuse, then increasingly more pointed (141, 1-3; 161).

Note 3. See the facade of the Palace of Rakka. Recall that the pointed arch was known to the Sassanian school, and m much earlier to the schools of ancient Mesopotamia.

Note 4. Speaking of semicircular arches, a Mohammedan of Syria wrote at the beginning of the 13 th century:-- "Those are Latin arches, i.e., round arches". (Cited by M. de Vogue. Temple de Jerusalem, page 94).

The horseshoe form, that forms a peculiarity of the Moroccan-Andalusian style, was at first exaggerated, and then lessened after the 12 th century (126; 139; 141, 10-12; 142, 1).

We have had occasion to indicate its role of masking a structural expedient in order to omit the carpentry support of the centre. [1] With a view to reduce the proportions of the l latter, Mohammedan architects conceived the erection by horizontal corbelled courses for the lower half of the arch, and to arrange by receiving the springing points of the voussoirs, to obtain points of support for the centre. Covering the angles with mortar produced a festooned appearance and turned
225 the artifice into a charm, so much appreciated, that it was early sought without any reason of a structural advantage. (120; 123; 134; 139; 142, 3,4; 154; 155).

Mohammedan India continued to use the ogee outline, which pleased Buddhist and Brahmin India (pages 316, 324); (127; 1 128; 134; 135; 141; 8,9). Yet from the moment (decline of t the 13 th century) when it adopted the system of radiating c courses, its use formed a structural heresy. It was likewise for ornamental reasons, that this form was chosen in other parts of the Mohammedan world, in Turkestan, for example (121), and in the Turkish country (131, 132; 160).

226 The school of Syria and its related one of Egypt were characterized by the excellent masonry of their arches, which frequently comprised strengthening by indentations (142, 6).

Charmed with lightness and effect, Andalusia conceived the replacing of solid tympanums by lattice work in pottery.(142, 7). It further distinguished itself by an ingenious method of constructing an elevated portico with columns of small height. [1]

Note 1. See the Mosque of Cordova and the Alcazar of Seville.

Superposing two series, these were either fixed -- when the upper story consisted of small piers -- by means of arches t turned between them at the levels of bases and mid-heights ((140, 143, 10) or -- when all were columns -- by the aid of half arches connecting in pairs the capitals of the supports in the lower series with the imposts of the upper arches (142, 11, 12).

Covering.

The various systems for covering an interior were familiar to Mohammedan construction.

The ceiling was usual in Morocco and Spain, as well as in

Egypt until the 12 th century (140, 2).

Jerusalem retains over the Mosques El Aksa and the Kubbet-es-Sakhra [2] wooden shells, constructed like the hull of a vessel, i.e., composed of planks nailed on numerous meridian ribs in the form of pointed arches, rendered stable by their joining a single strut and their intersection at different heights by cross beams and diagonal braces (140, 3,4).

Note 2. The existing shell dates from 1022 and reproduces another, contemporary with the edifice and destroyed in 1016.

The types of vaults employed by Mohammedan architecture are in order of frequency, the dome, cross vault and tunnel vault. To realize the latter in bricks, it continued faithful to t the oriental tradition of construction by slices. [3] In Persia and Mesopotamia, there seems to have been appreciated the Sassanian artifice of paneling the upper part of an interior by means of great arches supporting transverse vaults. (148, 14). [4]

Note 3. See volume I, pages 71, 138; volume II, page 14.

Note 4. See the Khan Orthma at Bagdad (12 th century); a bridge near Tauris, published by Dieulafoy. For the Sassanian prototype, see page 16.

The cross vault, jointed diagonally, was in constant use, particularly in Syria; for love of effect, the intersections were multiplied.

From the 10 th century -- i.e., a century and a half before the epoch in which it is found in France -- the system of the ribbed vault was known to the Andalusian school; within the mihrab of the Mosque of Cordova (965) and the Mosque of Luz at Toledo (144, 12.13).

Yet in Persia and India at all times and in Egypt after the 14 th century, covering by domes was the rule.

Various profiles were common, all being stilted; elongated ellipsiidal, or with conical crown in Persia; pointed in Egypt; conical in Mesopotamia and Seldjouk Anatolia (144, 17); bulbous in modern Persia and in India (121; 124; 127; 135; 1 138; 150).

Note 1. For the Indian origin of the bulbous outline, see Book V, part I.

Ingenious and scientific, the Persian school conceived several kinds of construction, some of which are very remarkable;

we cite that witi niches in series above each other, examples of which are offered by the Tomos of Zobeidah and of Ezekiel at Bagdad and that of Daniel at Susa (144, 11); that by corbelling or stalactites (Chapter 5, page 238), an idea of which is given by the porch of the principal liwan of the Mosque D Djouma at Ispahan (119; 123; 128; 138; 152); the cellular, observed in the funerary Mosque of Sultanieh (144, 1,3); the bulbous, a typeical specimen of which is formed by the Gour Emir at Samarcand (144, 7). The third is characterized by t the division of the masonry into two thin shells, connected by transverse partitions, which bind together the shells. T The last comprises the division of the height of the calotte into two parts; a lower one in which the horizontal courses overhang the surface of the drum, and an upper one where the beds radiate; the system is strengthened by a framework and ties, and is sometimes aided by the sides, detached from the intrados and tending toward the centre (144, 7).

Careless of stability, the Andalusian school practically r realized a light shell by using hollow prisms of gypsum, connected by a mortar and a covering of the same material.

The expedients by which Mohammedan architecture required t the fitting of a dome to the top of a square support varied, according to whether they were applied in Persia and India, in Europe and Ottoman Asia, or in Egypt. In the first case, this was that of an angle trumpet executed according to the Sassanian formula (page 15; 144, 8), or rather by means of a system of consoles obtained by the progressiwe corbelling of horizontal courses, and strengthened by arches (144, 6110). The Ottoman school employed sometimes the Byzantine pendentive of a spherical triangle (page 162), sometimes that in stalactites, [4] preferred and perfected by Egyptian architects ((144, 15,16).

Note 4. See the half domes of the Mosque of Ahmed I at Constantinople.

According to oriental tradition,[1] and in conformity to the geological conditions of countries exposed to earthquakes, M Mohammedan constructors never failed to strengthen their structures by wooden anchors, enclosed in the thickness of the masonry, and by visible ties across arches and domes.

Note 1. Volume I. pages 156, 187; Volume II, page 11.

The manner in which the Persiand provided resistance to pressures and thrusts of vaults -- otherwise reduced by their method of constructing the lower portion with horizontal courses -- indicates as much science as ingenuity.

At first, they set the calotte nearly on the internal side of the top of the support, so that the portion of that outside it performed the office of a buttress. Better yet -- so proceeded the author of the Mosque of Sultanieh -- by duplication of the drum supported the dome by a second external one, connected to the former by an annular vault, they created a continuous flying buttress; by substituting great arches for the solid walls, they secured the ability to concentrate on some supports, selected and reinforced by a top load, the stresses of the hostile forces (144, 1,2). Let us add that the system of corbelled pendentives tended to the development of a centripetal force suited to neutralize the centrifugal force of the dome (144, 9).

The Ottoman school derived equal honor from the very elegant solution of the problem of abutments, that forms the covering of the Mosque of Ahmed I at Constantinople. A great central shell on arches is abutted by four half shells, since a all are largely open at their bases, the whole is so harmonious, that it appears light (144, 4,5; 145). [2]

Note 2. From the point of view of the impression of its v vastness, we may compare the covering of the Mosque of Ahmed I at Constantinople with that of the Tomb of Mahmoud at Bijopore, whose dimensions are as follows:--

Sides of the square support, 135 ft.

Pendentives spring 57.4 ft. above the ground.

Tops of pendentives are 110.0 ft. above the ground.

Diameter of circle limiting them, 87.0 ft.

Diameter of the calotte, 124.8 ft.

Vertex of calotte 178.5 ft. above pavement.

Thickness of calotte at base, 11.5 ft.

Thickness of calotte at top, 9.0 ft.

Conditioned by a hot climate and a lack of wood, the roof is almost always a terrace of tampel earth. When the edifice is vaulted, the extrados of the shell takes the place of the

229 roof. Still, let us note the copper covering of the wooden
230 dome of the Kubbet-es-Sakhra at Jerusalem, and the gable roof with trusses and tie beams, which cover the aisles of the Mosque at Cordova.

Chapter 5. Effect.

Nothing is more characteristic of Mohammedan architecture than its passion for effect, the origin of its most brilliant qualities as well as of its gravest defects.

I. Effects of Harmonic Order.

Mohammedan art was no more ambitious to enrapture the mind by the manifestation, than to astonish it by colossal proportions, or to impress the imagination and the heart by an artifice of arrangement and of lighting. The Persian and Indian schools alone -- the Ottoman and Egyptian, so far as dependent on the preceding, -- in restricted measure, proportional to the influence of Persia, were pleased by combining an entirety, [1] by candecing a composition, [2] and by refining a form, [3] A universal method of utilizing the scheme of a geometrical construction [4] for outlining a plan, for the arrangement of the ornamentation, for placing in proportion, was the cause, that under the variety, complexity and caprice of Mohammedan monuments are concealed the unity and rhythm of a mathematical arrangement (147).

Note 1. For example, see the cruciform plans of Persian m mosques (137, 7,8), their rectangular portals between two minarets (138); the centralized and balanced arrangement of the Bridge Rokn-ed-din at Ispahan; particularly the great groups, that are the glory of that city; its Park and the Meidan, with its enclusure of porticos in two stories, its monumental gateways, one of which gives access to the Imperial Mosque. (124).

Note 2. See the very symmetrical outline of the Ottoman mosque (137, 6) and of the Great Mosque at Delhi; the radiating and equilibrated composition of the great Indian mausoleums (127; 135); the candeced grouping of the elements of Ottoman and Indian roofs (149; 150).

Note 3. The Persian school is recommended by a feeling for lines manifested by the exquisite elegance of many of its domes, composed of two calottes of different heights; one being calculated for the internal, the other for the external effect (124; 138). Under its influence, the Egyptian school of t the 15 th century also sought refined curves; witness the purity of the profile of the dome of the Mosque of Kait Bey at

Cairo, and the very harmoniously accented profile of its minaret (146; 148). The Indian school yields the same observation (127; 135; 150).

Note 4. Thus at the Mausoleum of Sultanieh, all dimensions are derived from the diameter of a circle inscribed in the p polygon of the outline of the walls; the positions of the two centres of the Syrian pointed arch are determined by a distance from the centre of the chord equal to one eighth of that line; those of the four centres of a Persian arch are obtained by two constructions, explained by our sketch (147, 1,2); the assemblage of Andalusian stalactite vaults (page 226) is regulated by the combinations of seven sorts of prisms, one with rectangular section, five with right-angled triangular sections, and one with horizontal section drawn as a lozenge or a half lozenge (147, 3); finally the polygonal and the "arabesque", dear to Mohammedan decorators, exhibit solutions of the problems of constructive geometry (page 250).

II. Effects of Picturesque Order.

In brief, to the effects of a picturesque order tended all the sympathies of Mohammedan architecture.

Fig. 147. Mohammedan application of the system of outlining and proportioning by geometrical constructions. Page 232.

1. Octagon of Kubbet-es-Sakhra at Jerusalem. (Section on the apothem). The apothem being divided into 16 equal parts, the 9 th is chosen for the axis of the drum. The equilateral triangle O C D is constructed on that axis and gives the height C D of the drum; the triangle A B C gives that of the external wall and the height I B of the top of the intermediate wall. The triangle O I E is constructed on the axis of the triangle A B. C and gives the height O E of the interior of the dome. The parallels to the sides of the triangles previously mentioned drawn from each division of the apothem or t their middles, give points of the details. (After M. De Vogue. Temples de Jerusalem).

2. Mausoleum of Sultanieh. (147). The greatest diameter a b, taken vertically, gives the top c d of the supporting w walls. The least diameter A B, taken twice in the same direction, gives the vertex V of the calotte. The measure of one side of the octagon, taken once vertically, gives the level

I K of the sills of the opening in the second story, and taken twice, the level L M of the crest of the arch. The apex of the equilateral triangle constructed on G H gives in Y the top of the opening in the ground story. Its width is determined by the construction of a square N P Q O within the triangle previously mentioned. The vertex of the arch Z is given by the superposition of an equilateral triangle on the square P T U S. (After M. Dieulafoy, Art Antique de la Perse).

3. Division of a stalactite pendentive into prisms (147), whose sections are a rectangle (B), a right-angled triangle (A), a lozenge (C C) or a half lozenge (C). (After Owen Jones, Alhambra).

4. Outline of the depressed arch of the Persians. (147). 1. On A B (half span of arch) construct the square A D C B; divide A B into 6 parts. Draw C O^2 (C 1 = O^2 4). From O^2 as centre describe D 2. -- 2. Divide A B into 4 parts. From the first division O 1, describe Z B. (After M. Dieulafoy, same work).

In good measure, these required monumental modelling. Like the feeling for harmony, the taste for the appearance of a g general relief was confined to Persia, India, the Ottoman empire, and to Egypt in the 14 th and 15 th centuries. It is expressed by the powerful contrast, that the arrangement of a Persian mosque institutes on the one hand, but the verticality of the four liways (page 215) and the horizontality of t the intermediate galleries, and on the other, between the shaded accenting of the facade of the former, and the continuity of the front of the arcade of the latter; [2] by the majesty of the insertion ofan elevated platform, accessible by monumental stairs, and by the Rythmic variation of unequal masses and of diverse shapes, which characterize certain mosques in India [3] by the hierarchical grouping of a high central dome, the subordinate ones, angle towers and turrets, that Indian mausoleums erect above a terrace rising from gardens; [4] by a story of subsidiary calottes, and by the inheritance of the slender "candles" (minarets) exhibited by Ottoman mosques; [5] and by the irregularly accented reliefs of the mosques of the best epoch in Cairo (148). [6]

Note 2. For example, see the Imperial Mosque at Ispahan ((124; 138).

Note 3. See the Great Mosque of Delhi (150) and that of F Fathpur Sikri.

Note 4. See Mausoleum of the emperor Humayun (135), Tomb of Akbar at Sikandara, and Taj Mahal at Agra (127).

Note 5. See Mosque of Ahmed I (149), the Sulemanie at Constantinople.

Note 6. See funerary mosque of Kait Bey at Cairo (148).

Pursued in the same spirit, the search for effect by modeling the separate masses sometimes produced the most happy results. It particularly affected the dome, whose outline was always slender, often ogee and even bulbous, terminated by an ending in a slender point, or sometimes by a lantern (121; 124; 127; 135; 138; 1465 148; 150); [7] and still more the minaret, whose shape further appears to have been conditioned by local traditions (151). In Mesopotamia, on the model of the Babylonian-Ninevite ziggurat were erected towers with a helicoidal ramp and crowned by a kiosk; [8] Syria adhered to the p prism on a square plan, quite stumpy, that in the pagan and Christian epochs it erected as a funerary monument, and which fashion was introduced into Morocco and Spain [9] at the same time as the religious and political influence of Damascus (1 (118; 151, 2). Doubtless in the image of the Pharos of Alexandria, formed by placing an octagonal on a square prism, the
235 Egyptian school, after attaining maturity, placed several fo-
236 rms above each other -- generally three --, each successively smaller and differently shaped (square and octagonal prisms, cylinder) with platforms corbelled out, the top being crowned by a lantern (148; 151, 3).[1] Always charmed by slenderness, [2] Persia adopted the form of a slightly conical shaft surmounted by a projection bearing a pavilion (119; 124; 138, 4). [3] Inclined to redundance, India conceived the superposing of s several slender and diminishing cones (150). [4] Finally, the Ottoman school -- perhaps impressed by the triumphal columns of Constantinople -- erected tall minarets terminated by a p pointed cone and with balconies at different heights (149; 151, 5).

Note 7. See Cairo.

Note 8. See the Mosque of Samarra and that -- imated from it -- of Ibn Touloun in Cairo.

Note 9. See the minaret of the Great Mosque at Damascus; t that of Tangier, the Giralda of Seville.

Note 1. See particularly the minaret of the funerary Mosque of Kait Bey.

Note 2. Note the very slender proportions of Achemenide c columns. (Volume I, page 410).

Note 3. For example, see the Mosque of Ispahan.

Note 4. See the minaret of the Mosque of Koutab at Delhi.

Note further the grand movement of the Persian portals, resulting from the twofold contrast of their rectangular panel with the slender cylinders rising at the angles -- and with the pointed arch, which pierces it (124; 138); not forgetting the elegant as well as picturesque forms of the kiosks and p pavilions (125; 126; 131).

Effects of Secondary Relief.

Mohammedan monuments present numerous and remarkable examples of obtaining the effect by secondary reliefs.

In the first place, it is necessary to mention the shaded recess hollowed in the front of facades, Syrian, Persian, Seldjouk and Ottoman, and finally Egyptian in the 14 th and 15 th centuries, [5] and the enormous porches, high and deep, frequently flanked by lateral niches (119; 124; 127; 128; 135; 138; 148; 150; 152; 166). [6]

Note 5. For example, see the Mosques of Hassan and of Kait Bey.

Note 6. Concerning the lateral niches, see particularly t the Ottoman and Seldjouk porches (119).

Let us mention then -- useful as well as ornamental, since in strengthening the facades, it permits thinning the masonry -- a treatment of the surfaces by a system of great pilasters, as shown by many monuments of Cairo (148; 152); or of arches, as on the Palace of Rakka, the Tomb of Zobeideh and the Mausoleum of Sultanieh; or at the sides, as shown by certain Persian, Indian, Seldjouk and Ottoman and Egyptian monuments; [7] (119; 121; 151); or finally the network panels, common in Corocco and Spain after the 12 th century (118).

Note 7. See the side dome of the Gour Emir at Samarcand; the minaret of the Mosque of Koutab at Delhi; the conical do-

domes of Anatolia; the Seldjouk and Ottoman minarets; the ending in wide caps of certain minarets in Cairo (that of the Mosque of Baber Gachenguir, for example.

Notable again is the play of light and shade, impressive a and varied, produced by the projections of the stalactites a and their shape in curved and angular recesses; in prismatic crystalline forms in successive rows, even in slender pendants (119; 120; 123; 128; 138; 144; 145; 152). Finally, we cite as common to the Seldjouk and Ottoman schools, a method of enhancing by a great ornamental panel on the flat surface of a tympanum (119).

On the other hand, so to speak, no mouldings; a lack resulting in great measure from the predominance of the construction in bricks.

It is again a characteristic of Mohammedan architecture, t that its love of festoons revealed by the current use of trefoil arches (135; 154; 151) [1] and of toothed projections, frequently complicated (118; 148; 150; 166).

Note 1. The construction of these festoons was very simple; at regular distances by the projection of one or more bricks from the surface of the intrados formed a milled edge, whose angles were rounded by a coat of mortar or of plaster (142,5).

Effect by Relief of Details.

That was necessary for Mohammedan art to derive from the r
239 relief of details effects approximating those just enumerated.

Concerning the isolated support, aside from the caprices of the Indian school, the shape of the pier was monotonous; generally rectangular and often polygonal, as in Morocco, it is that of a rectangular prism with little columns inserted in the angles in the Cairo Mosque of Ibn Touloun; in the Mosque
240 241 Djouma of Ispahan, that of a group of four cylinders (137, 7); [1]
in the Mosque of Ahmed I at Constantinople being that of a f fluted shaft (145) etc.

Note 1. Notable is the analogy of this type with that realized in Chaldea thirty centuries B. C. (Volume I, page 135). Assuming that the Mosque of Ibn Touloun was imitated from that of Samarra, the mode of little columns in the angles of t the piers must be an importation from Mesopotamia.

Neither does the column lend itself to a prolonged study.

Its shaft is without diminution or entasis, and often sets d directly on the ground (139); it is generally plain, sometimes turned like a baluster or even twisted (120; 153, 6-9,11, 12; 155). The capital is rather mean, frequently reduced to a simple slab. In Spain and Morocco, it is derived from the Roman Composite (120; 153, 9) or from the Byzantine impost b block, and it ends in the appearance of a prism twice as wide as high, surmounting a cylindrical shaft surrounded by a collar of very much conventionalized acanthus leaves, connected like the elements of a fret (153, 1,2,4,10); a bell or bulbous shape is not rare (153, 3,12); in Persia and Spain was an imitation of corbelled stalactites (153, 7; 155); in Turkey, of a group of crystal forms (153, 8). Andalusia loved graceful proportions (120), and in Turkestan, doubtless under the influence of China, [2] the Persian school imposed on stone columns the height of posts (153, 6).

Note 2. Further, see Book V; also note the very remarkable slenderness of the Achemenide columns. (Volume I, page 410).

Effects of Ornamentation.

Mohammedan architecture had a passion for ornamentation; in the interior, it lavished this over all surfaces possible; externally it was placed on the portals and niches, around the windows, on the domes, even on the entire edifice. [1] It was easily abused. But its elements were realized with a taste and art equally admirable, and it was applied with a very assured feeling for the effect, which very frequently appeared exquisite, though unequal.

Note 1. See the external mosaics of the Mosques of Jerusalem and of the Great Mosque of Damascus; the sculptured extrados of certain domes in Cairo (146); the portals of the Seldjouk monuments (119); particularly Persian and Indian monuments. Also note the Persian mode of decoration of the joints by modeling ornaments on the mortar (see the Mosque of Veramine), even by covering the joints with glass (see Dieulafoy. Acropole de Susa, p. 312).

Conditioned by the oriental temperament, by Mesopotamian-P Persian and Syrian tradition, but the current practice of construction in brick, and finally by an energetic influence of the style of decoration appropriate for fabrics, it neglected

effects of relief, loved those of design, had an affection f for those of the materials, and adored those of color.

Its monumental sculpture was essentially flat, realized by engraving, overlaying, sinking and embossing. On wood, it flourished in Egypt; on stone, in the same country after the 14 th century, in Spain, at least for the capital, before the 13 th; in Syria, Asia Minor, European Turkey and particularly in India, in all epochs. In Egypt before the 14 th century, in Morocco and particularly in Spain, its execution was commonly mechanical, by modeling in mortar, stucco, and especially in plaster, or by the impression of moulds on a mass of t these materials while still fresh. In all fashions, its technics were a marvel of patience and skill (120; 155; 156).

A decoration by combinations of lines or surfaces resulted, not only from operations of incising, of marquetry incrustation, sinking or painting, but also from refinements in masonry, such as varied arrangements of bricks, or sometimes complex indentations of stone blocks, particularly of voussoirs -- methods appropriate, the first to Persia and the second to Syria and the countries under its influence (142, 6).

As we have stated, Mohammedan architecture was passionately fond of beautiful materials, that it appreciated especially for the gleam of light reflected by their polished surfaces. It was lavish with stucco coatings; wooden panelings were especially loved in Egypt; facings and pavements of marble were common in the same country (157; 158; 164; 165); incrustations of hard stones were the great luxury of the Indian school in the time of the Grand Moguls (128; 134; 157); [2] gilding; applications of mirrors or of glass cut in facets, which modern Persia adores; [1] finally, facings of faience, whose use was universal in the Mohammedan world, and the quantity used was enormous in Persia, Asian and European Turkey (121; 123; 136; 138; 145; 160).

Note 1. Decoration white, blue, yellow and red.

Note 2. The fashion was introduced by Europeans. The artist of the procedure was a Frenchman of Bordeaux, named Augustin or Austin.

Note 1. See the Pavilion of the Mirrors at Ispahan.(125).

Effects of Polychromy.

Effects of Polychromy.

Yet nothing was loved as much as color, and no means of producing a rich and universal harmony existed, to which recourse was not had.

Persia composed judicious harmonies by utilizing the diversity of tones offered by bricks, according to their burning.

From dichromy was obtained; in European and Asian Turkey by the alternation of layers of bricks and courses of stone in the Byzantine fashion; in the same region, as well as in Egypt from the 14 th century, and particularly in all epochs in Syria, by the contrast of stones, white and red or white and black (139; 148).[2]

Note 2. Gray, red, dark brown.

Finally, a polychromy was magnificently realized; either by painting on stucco, a system in favor in Egypt before the 14 th century, in Persia and India after the 16 th, in Spain and Morocco at all times; either by admirable marquetries of marble, in which Egypt excelled in the 14 th and 15 th centuries;[1] of more economically by stucco or mastic colored by recessions in the surface; or by incrustations with hard stones, of which India made a marvellous use (134; 157); or in very restricted measure and only in Syria, Egypt and Spain -- before the 12 th century -- by enamel mosaics in the Byzantine taste;[2] finally, and especially by ceramic facings, loved by all schools, but in which triumphed those of Persia and of Ottoman Anatolia.[3]

Note 1. Recall that the taste for marble facings already characterized the Alexandrine school.

Note 2. The execution moreover was Byzantine. See the mosaics of the Kubbet-es-Sakhra at Jerusalem; of the mirhab of the Mosque of Cordova.

Note 3. Indeed in central Asia, the tradition of the ceramic facing is lost in the darkness of ages. (Volume I, pages 106, 144, 417).

At first Persia was contented with a coating of glaze on t the edges of the bricks. Thus it practised a mosaic of bits of faience cut in squares, assembled either on the wall, or in the workshop on a supporting panel of mortar or mastic, in both cases being consolidated by the introduction of liquid

cement in the joints (159).[4]

Note 4. The Persian monuments (for example the Medresses Kara Tai and Sirtcheli at Konieh (13 th century)) exhibit marvels of patient technics and veritable mastery.

244 At the same time, it created a delicate ornamentation by s submitting a tile to the work of the graver, which removed t the enamel in places, making the surface appear matted and w with a reddish yellow ground.

Finally, it adopted the less artistic and less durable, but infinitely more economical method of a covering of tiles covered by painted ornamentation (131; 160).

Refined artists and incomparable artisans, the ceramists of Persia and of Asia Minor (123; 131; 145; 160),[1] and to a lesser degree those of Spain,[1] created decorations of rare beauty and marvelous diaperings, as harmonious as splendid. The Persian palette was charged with turquoise blue and cobalt b-blue, yellow ochre, dark green, black and white;[2] the Anatolian with light and dark blues, green, yellow, violet, brown, tomato red and white; the Andalusian with blue, light green and brown. Frequently the gleam of enamel added yellow or g golden metallic reflections. After the 14 th centurn, Persian tiles comprised parts in relief.

Note 1. The ceramic industry especially prospered at Nicea in the 15 th and 16 th centuries.

Note 1. Known under the name of azulejos, the Andalusian tiles were common in Spain from the 13 th century, and Seville almost monopolized their manufactore.

Note 2. We borrow from M. Marcel Dieulafoy (La Vase d'Horyouji, page 12) a very interesting observation.

The composition of the Persian palette dated from the 7 th century, the epoch in which it replaced that of the ancient ceramists of Mesopotamia-Persia, charged with less rich colors and lower tones. Since China, in the second half of the 7 th century, had just introduced into Japan the taste for strong tints and warm harmonies, was not the evolution just mentioned the result of a symmetrical radiation of Chinese e esthetics toward the West?).

In the decline of the 13 th century, the Egyptian school c conceived the idea of completing the diapered polychromy of

internal surfaces by that of glass, which formed a variously colored mosaic, inserted in the openings of a plaster screen or assembled like stained glass. The innovation was fortunate in Syria and Turkey (122; 161; 162). [3]

Note 3. For example, see the stained glass of the Kubbet-es-Sakhra in Jerusalem, which date from the 16 th century. (162).

249 Mohammedan Ornamental Inspiration..

Mohammedan decoration was substantially ornamental. The Commentary on the Koran, if not the Book itself, forbids the representation of God, man and animals. Yet in Syria in the time of the Ommiades (163); [1] in Egypt from the 10 th to the 13 th centuries; in Persia in all epochs and in India of the Grand Moguls, the prohibition was transgressed. In the same places and within the same chronological limits, the floral motive was maintained in relations with nature (123; 131; 134; 157; 160); but everywhere else, the model was disfigured by an extreme conventionalization and by a composition, always strictly rhythmical, and often extremely regular and symmetrical.

Note 1. See the frescos, which decorate the Castle of Kusejr' Amra in the desert of Syria.(Also A. Musil, Kusejr'Amra).

In general, Mohammedan decoration loved the light scrolls of leaves and flowers, otherwise termed arabesques; it was also pleased by extending on long bands the elegant and picturesque Arab calligraphy of pious or commemmorative inscriptions (123; 131; 154; 155; 159; 160; 162).

Note 2. In Mohammedan calligraphy may be distinguished three types of character; the Cufic (from the beginning of the 8 th century to the middle of the 9 th), which is comparatively simple and very monumental, the Carmatic (from the last third of the 9 th to the decline of the 12 th centuries), whose angular letters flourished in sometimes excessive arabesques; the rounded Cursive (in vogue from the beginning of the 13 th century).

250 Everywhere it assigned the greatest part to geometrical ornamentation, generally treated in the style of textile decoration. [1]

Note 1. In Syria was maintained the traditions of an appearance of lace (see pages 60, 61 and 66), which was equally

in vogue in Anatolia (119), with exaggerations resulting from Armenian influences. On the nature of the latter, see page 95.

In Egypt after the 13 th century; in Morocco and Spain, it was devoted to the reproduction of drawings, that were multiplied by the passion of Arab mathematicians for the development of geometrical themes. By means of the sinkings by engraving or cutting out, the openings of perforations, contrasts of marquetry, the network of a trellis, the sculpture of stalactites, it organized combinations of straight or curved lines and of polygonal or cylindracal surfaces, producing an a appearance of crystallizations (120; 146; 154; 155; 156; 158; 161; 162; 164; 165).

This system of rectilinear or curvilinear interlacings was
susceptible of combinations in unlimited number and was recom-
mended, both by the satisfaction it gave to the abstract and
dreamy genius of the East, and by a remarkable alliance of t
251 the qualities of unity and variety. For on the one hand, it
amused by its diversity, entanglement, and the mutual depend-
ence of appearances, which changed not only as the view chan-
ged, but also whether the eye was fixed on but one mesh of t
the network or comprised several; on the other hand, it poss-
252 sed the attraction of a rythm harmoniously cadenced, and it
produced in the mind the pleasure of discovering the reality
of a secret logic and a mathematical coherence under the app-
earance of fancy and caprice.

Note 1. Fig. 165, Yellowish gray, red, brownish black.

Mohammedan Gardens.

The decorative ideal revealed by the analysis, which we have just made, we recognize in the composition of Mohammedan gardens. It also decidedly aims toward a picturesque effect; its means are the contrast of natural appearances with an art note energetically introduced by regular plantings, by a geometrical arrangement of the plants, by outlining channels and basins enclosed by stone or ceramic borders, and by the erec-
tion of kiosks and of porticos. To the accidental monumental
253 reliefs are added those of a modeling of the ground in terra-
ces, of the diversified relief of the vegetation, of cascades and fountains; while to the splendor of marbles, gilding and faience composed of reflections from the quiet water and the

sparkling of that in motion. It is not only on the "embroideries" of the flower beds, that is repeated the arabesques a and the polygonal forms so dear to Mohammedan ornamentists. Let us note that the gardens of Persia and those of India of the Grand Moguls manifest the taste for harmonious arrangements, as much as the edifices; for they are balanced with reference to the axis of a grand middle avenue, furrowed by a canal and subdivided by transverse alleys (127; 133, 2;(7, 7); 166).

254 Book IV. Eclectic Architectural Styles of Eastern Europe.

It is proper to present together here the Russian, Servian and Moldavio-Wallachian architectural styles, for the reason that their eclecticism drew from the same sources, and that one of these was the Mohammedan.

Part I. Architecture in Russia.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Conditions. -- Influences. -- Epochs.

I. Requirements.

For a long time thinly peopled and devoted to a thoroughly rural civilization; inhabited by a citizen class, not numerous but practical and coarse, and an aristocracy more than three-fourths barbarous; besides being always undes the shock of a Polish, Lithuanian or German invasion, and from 1224 for nearly three centuries, of a Mongol or Tartar incursion, mediaeval Russia did not form a land very propoitious to the development of a brilliant and original style of architecture. The sole favorable condition realized by it was the extreme devotion of the artless people, the more attached to their r religion, because being different from that of their enemies, 255 it symbolized their national individuality and their desire to safeguard this.

Yet from the 14 th century, the Russian cities and especially Moscow were rapidly enriched by a great commerce with Asia and by an active industry. At the same time, the Muscovite state was enlarged, and Moscow took the rank and figured as the capital.

In fact, the Russian requirements had as their objects; first a multitude of churches and monarteries; then fortifications and bell-towers of the cities; but neither monumental tombs nor magnificent palaces.

II. Monumental Chronology and Topography. [1]

Note 1. For architecture in the Baltic provinces and in F Finland, see Volume III of this work.

In the decline of the 10 th century and in the southeast of the country commenced the existence of a cause for demands: then Kiev, "mother of Russian cities", was prosperous under the government of S. Vladimir (980-1015), who in 988 proclaim-

proclaimed the orthodox Christianity of the Byzantine religion as the official religion of his rtate; from that epoch dates the plan and a part of the erection of the Church of S. Basil in that city.

The first half of the 11 th century was a period of advance for the mediaeval Russia, marked by the founding of cities, 256 by a sketched civilization, and by an active propagation of Christianity in the centre of the country. Under Jaroslav t the Wise (1019-1054), Kiev continued to grow and assumed the role of religious metropolis of the country -- of the "Russian Jerusalem"; its Cathedral of S. Sophia (1020-1037) [1] dominated four hundred churches and chapels! On the other hand, such were built at Tchernigow (Church of the Saviour); at Smolensk (Cathedral of the Assumption); particularly at Novgorod the Great, enriched by an active commerce with Europe and by the exploitation of central and northern Russia (Monastery of S. George, south of the city; Cathedral of S. Sophia (1045-1052).

Note 1. It belonged to this time by the five aisles of the middle part and the internal arrangement.

In the second half of the century, the demand lessened (Cathedral of the Assumption at Kiev (1089)). But it was resumed in the course of the 12 th; at Kiev, then in full decadence -- Monastery of S. Michael (1108); at Pskov, that the Hanseatic League caused to prosper -- Cathedral of the Trinity (about 1138), Church of the Monastery of the Saviour (1056); at Perejaslav - Zaljeski -- Cathedral of the Transfiguration (about 1155); at Sousdal -- Cathedral of the Nativity (12 th century); at Vladimir, which was founded in 1116, and developed under the impulse of Andrei Bogoljnbski (1169-1174) -- Cathedral of the Assumption, the work of that prince; Church of the Nativity (1191); Cathedral of S. Dimitri (1197). The demand continued during the first half of the 13 th century; at Smolensk -- Cathedral of the Assumption (beginning of the century); C Churches of S. Michael Archangel, S. Peter and S. Paul; at Jaroslav -- Monastery Spasso-Preobrashenskij with two churches (1216 and 1218); at Rostor -- Cathedral of the Assumption (1230), at Kostroma -- Cathedral of the Assumption (1240); at Jouriev--Polskij -- Cathedral of S. George (1234); at Tver --

Cathedral of the Transfiguraltion; Monastery of Ostrotsch (middle of the century), etc.

But in the second half of the century and in the first of the 14 th, architecture suffered from the results of Mongol invasions (1224, 1237, 1242) and from the division of the country into little rival principalities.

It was resumed from the moment in which were felt the effects of the skilful and energetic politics of the great princes of Moscow, "assemblers of the Russian land" and champions of orthodoxy. Ivan Kalita (1328-1341) built in the Kremlin at Moscow the Church of S. Michael Archangel, of the Saviour in wood (1330), the Cathedral of the Assumption, which was to become the sanctuary of Russian czarism. Under the glorious Dimitri Donskoi (1363-1389) arose in the Kremlin the Monasteries of Zschudov (1358) and of the Ascension (1389); in the city those of Andronov (1366) and of Ssimonov (1370). At the end of the century, the Kremlin was endowed with a new Cathedral of the Annunciation (1397). At the same time monasticism flourished; ruined by the Tartars, the famous Monastery of Troitska, that S. Sergius had founded in 1340, was restored in larger form at the beginning of the 15 th century; that of the Saviour at Moscow was established in 1352, and in 1429 w was created that of Solovetskij on an island of the White Sea.

Yet the decline of the 14 th century and the greater part of the succeeding one were for Russia an epoch of depression, brought to an end by the reign of Ivan III the Great (1462-1 1505), the creator of Muscovite greatness. Under that prince, whom his marriage with a Byzantine princess (1472) inclined to luxury and show, the Kremlin became a workyard, from which came a new Cathedral of the Assumption (1475-1479); one of t the Annunciation (1484-1495); a festal hall, the Granovitaja Palata (1473-1490); the Gates of the fortress called Nikolskija and Spasskija (of the Saviour; 1491); a Church of S. Michael Archangel (1503); besides which was built in Moscow a new Monastery of Our Saviour.

The reign of Vassili Ivanovitch (1505-1533) was in all respects a continuation of that of Ivan III, and enriched the Kremlin with A Cathedral of S. Michael Archangel (1505-1508); with another under the name of the Ascension (1519); with a

new Church of the Saviour (1527); and Moscow with a Monastery of the Virgin (1524), commemmorating the annexation of Smolensk. In 1528 was rebuilt the Cathedral of the Nativity at Sousdal.

From the time of Ivan the Terrible (1533-1584) date a Palace and churches at Kasan, conquered in 1552; the curious Cathedral of Vassili Blashenny at Moscow, the work of two Russians, Barma and Postnik; and most of the buildings of the Monastery of Solovetzkij.

Then the demand lessened.

The end of the 16 th century and the beginning of the 17 th were an epoch of disturbances and of invasion, to which belong the Tower of "Ivan the Great" in the Kremlin (1584-1598), and in the city of Moscow, the Church of the Assumption -- t the "Red Church" (between 1598 and 1605), and the Cathedral of the Trinity at Kostroma.

In the 17 th century construction languished; in the Kremlin of Moscow a Church dedicated to S. Michael Malein (1634) and a Palace, the Terem (1636); in the same city the Church of Our Lady of Kazan, commemmorating the expulsion of the Poles (1625); one of the same name at Markov in the government of Moscow; at Jaroslavl, Churches of Iljinskaya (1647-1680), Nikoly Mokrago (1665), S. John Baptist (1671-1687), Churches at Rostov etc.

The founding of S. Petersburg in 1703 produced important a architectural enterprises, which developed during the reign of Peter the Great (died 1725); the first Palace of the Admiralty (1705); Fortress and Cathedral of Ss. Peter and Paul ((1714-1733); Palace of Peterhof (1720); Monastery of S. Alexander Newsky, with a Cathedral of the Trinity (1724-1798). Lessened by a transfer of the court to Moscow under Catherine I and Peter II (1725-1730) -- a new Admiralty (1727), it was resumed in consequence of a definite reestablishment of the government on the banks of the Neva -- Winter Palace (1732-1 1764), Tower of the Admiralty (1734-1735), Cathedral of the Resurrection (1738-1835) etc.

For the provinces, we cite the Cathedral of the Assumption at Kiev in the government of Archangel; a restoration and transformation of the Cathedral of the Assumption at Kiev (1729),

Church of S. Andrew in the same city, the work of Rastrelli (1744-1767); and a Palace in the Kremlin of Moscow (1753).

III. Conditions. -- Influences. -- Periods.

Natural Conditions.

The natural and human conditions met by the evolution of R Russian architecture appeared characteristic and efficient. On the one hand, a brutal climate with extremes of heat and cold, much humidity and abundant snowfalls; a ground generally poor in stone, but rich in good brick clay, and with abundant wood in the middle and northern zones.[1]

Note 1. Yet the convenient transportation by water permits in a certain measure obtaining materials from outside; thus most of the churches of Moscow are built of stone, though this is lacking in that region.

On the other hand, the geographical position of Russia intermediate between Europe and Asia; its broad opening toward the second of these portions of the world; the facilities for transportation produced by its level territory, the navigability and the radiating distribution of its watercourses, predestined it to be influenced both by Asian and European arts, therefore attempting a compromise between the two, always to the advantage of the first.

Influences.

In fact, in all epochs of its history, Russian architecture was more or less tributary to foreign architecture.

And first, it borrowed from Byzantium, at the same time as its religion, the programme of its temples, the forms of its edifices and a great part of their decoration.

Still the singular resemblance of the plan of S. Sophia of Kiev to that of the Georgian Church of Mokwi (52, 5; 172, 1); the pyramidal form of certain domes; particularly the conception of the relief ornamentation of many ancient churches, attest that a Byzantine influence was strongly competed with by an Armenian influence. This is explained at the same time by the radiation of Transcaucasian monasticism; by the relations of the Russian princes with Georgian and Armenian;[3] finally, by the establishment on the Russian frontiers, of colonies of fugitives from Ani, after the taking of that city by the Mohammedans in 1064 (page 85).

Note 3. Note the marriage of the prince of Vladimir, George II (1212-1228), with a Georgian princess, and that of the prince Iziaslav Mstislovich of Polhynia (died 1154) with a princess of Abkhazie.

Further, the taste of the Russians for bulbous domes and t the floral motives dear to the Persians, as well as many frankly Asian forms of the decorations, announce a Mohammedan invasion, that must have been favored by the political dependence of Russia on the Tartars, and its economical relations with them, from the 13 th to the 15 th century. [2]

Note 2. Note the presence of Russian architects and goldsmiths at the court of the Khans of Tartary in the 13 th and 14 th centuries. Also see page 262.

On the contrary, the ornamentation of monuments of the 12 th and 13 th centuries, such as the Churches of Vladimir, Sousdal, Perislav-Zaljeski and Jouriev-Polskij, reveals Romanesque suggestions.

The intervention of the West is emphasized from the last t third of the 15 th century. Zoe Paleologus, who married Ivan III, the grand prince of Moscow in 1472, had lived at Rome, and her entrance into the Russian capital gave access to Italian architects, to Aristotile Fioraventi of Bologna, author of the existing Cathedral of the Assumption in the Kremlin; to Pietro Antonio of Milan, the constructor of the Gates Spasskija and Nikolskija, and together with Marco Ruffo, of the
262 Granovitaja Palace; to Alessio Novi of Milan, who erected for Vassili Ivanovitch the Cathedral of S. Michel Archangel. In the 17 th century occurred an invasion of German and French formulas. In the 18 th, Peter the Great employed a Frenchman, Leblond, author of Peterhof; while the favorite architect of Elisabeth Petrovna was an Italian, Rastrelli, who introduced the "Barocco"style into Russia. (Volume III).

Yet from the middle ages, Russia manifested a real artistic genius and incontestable architectural aptitude. In the 13 th century, it furnished artists to the court of the Khans of Tartary; [2] after the 15 th, Moscow was the centre of an active and very remarkable production of jewelry, arms, embroideries and wrought leather, and the originality of the Russian monuments, before the submission of the country to western e esthetics, implies the existence of a national temperament a

among their designers.

Note 2. Note the mention made by Doplan du Carpin and Rubenquis, envoys sent to the Khans , the first by Innocent IV in 1245, and the second by S. Louis in 1253, make of Russian architects and goldsmiths, settled at Kaptchok and at Karakorum.

Now the native factor of Russian esthetics reveals to analysis a Finnish element, characterized by a particular element of the decoration, -- a Slavic element as a combination of v very practical sense, mysticism and ostentation; finally in a more geometrical way, a secular practice of carpentry. [3]

Note 3. Note what Herodotus (Book IV, 108) says of the city of the Gelons between the Don and the Volga, where everything was of wood, temples, palaces, and the enclosing walls.

Let us note that in Russia, the undertakings of religious edifices were always very largely endowed, and that those for which the czars of Moscow paid the cost, disposed of considerable means.

Epochs.

The history of Russian architecture exhibits the succession of four epochs; they are characterized, the first, corresponding to the 11 th and 12 th centuries, by a combination of Byzantine, Armenian and Romanesque influences and by a relative sobriety of style; the second, contemporaneous with the 13 th and 14 th centuries, by an appearance of luxury and caprice and by Mohammedan, Persian and Mongol intimacies; the third, synchronous with the 15 th and 16 th centuries, by a digestion of the importations and the maturing of a national style, the last -- from the 17 th century and particularly at the beginning of the 18 th century -- by a western invasion, which at first sterilized the Russian genius, and then -- in the decline of the 19 th century -- was opposed by a reaction of the native temperament.

Chapter 2. Programmes and their Realization. -- C Construction. -- Effect.

I. Programmes and their Realization.

The ordinary programme of the mediaeval or modern Russian church (172) is derived from the Byzantine formula of the central basilica with dome (page 148); a square nave precedes a raised sanctuary, composed of a choir and two chapels, all t these terminated by a semicircular apse; an iconostasis conceals the holy place (172, 2, 8, 8; 178). Porches and bell t tower are common, the second being independent of the edifice, which is always orientated; frequently extend lateral porticos, in the style of those presented by certain Armenian churches (52, 4,8).

The rule comprises exceptions; S. Sophia of Kiev, which has four aisles (originally five), the middle one more than twice as wide as the others, and crossed by transverse aisle of the same width before the sanctuary (172, 1); [1] such again is the Cathedral of Vasilij Blashenny at Moscow, a singular group of eleven chapels in two stories around a central sanctuary, the arrangement of which recalls both the radiating and cruciform type loved in Asia Minor and Armenia (pages 72, 87), and the shape of certain pagodas (168; 172, 3).[3]

Note 1. Compare this plan with that of the Armenian Church of Mokwi, page 87.

Note 3. See Book V.

As characteristic peculiarities of Russian domestic programmes, we mention a composition scattered in pavilions, the projection of great bays analogous to Mohammedan mushrabiyes; t the use of porticos, further explained by the rainy and snowy nature of the climate; finally, the external position of the stairways, realized under the form of open galleries attached to the facades (173).

II. Construction.

In the forested regions of central and northern Russia, wood is the usual material for domestic structures (173), and in large measure, that of the religious structures of the second class (171). Monumental programmes are commonly realized in bricks or with small stones.

The covering consists of tunnel vaults, cross vaults and d

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domes; the latter are ordinarily placed on high cylindrical drums pierced with windows, that form the chief part of the lighting of the interior; (168; 172, 1,2; 175; 223). The adjustment of the angles of the supporting square is obtained by means of pendentives in the form of a spherical triangle. A system peculiar to Russia, and which is recommended by a h happy combination of practical and pictqueresque qualities, constructs an octagonal dome by means of stories of arches c corbelled out from each other (174, 1,2); the imposts of the arches in one range either rest on the crowns of the lower s series (174; 3,4), or on small arches turned between the latter (174, 6).

The roofs, with very steep slopes on account of the necessity for ensuring the sliding of the snow, are of wood, tiles, or often of metal, and in case of a vaulted covering, are placed directly on its extrados (169; 173; 174).

266 III. Effect.

The most characteristic trait of the ancient Russian architecture was an immoderate love for picturesque effect, which accustomed it to excess of ornamentation and worse faults of taste.

No more than for qualities of harmonic order was it desirous of material greatness, the famous Cathedral of the Assumption in the Kremlin of Moscow measures inside no more than 1 124.7 ft. long and 75.5 ft. wide, and at S. Sophia of Kiev, the corresponding dimensions do not exceed 108.3 and 78.7 ft.

Nor was it more addicted to experiments in secondary relief, from which it was further diverted by the practice of construction in brick. In the fashion of Armenia, it always relieved the nudity of the external walls by slender half columns connected with the cornice, or by strongly projecting arcades as high as the edifice; both strengthening the constructing and in large measure indicating its structure (175, 1). The forms of isolated supports were heavy and mean (177).

On the other hand, it loved to impress by the general slenderness of the edifice, which was frequently higher than long;[1] (168; 171; 175, 1,2); by the height of the arcades that reli-
267 eved its facades; by bristling slender and pointed parts [1]-- drums so slender that some almost recall minarets; domes with

ogee profiles in the Persian fashion or as acute triangles in the Armenian mode, and surmounted by lanterns, spires and points, great carved crosses stayed with chains (168; 171; 175).

Note 1. The Cathedral of the Assumption in the Kremlin of Moscow, whose greatest width outside is 131.2 ft., extends 137.8 ft. above the ground.

Note 1. Twelve domes are counted on the Cathedral of Vasilij Blashenny of Moscow; thirteen on the Church of the Assumption in the same city, and fifteen on S. Sophia of Kiev.

It loved variety in appearance, to the point that certain church roofs combine as many as four types of different domes; it delighted in complications and in singular forms, such as twin arches without a support for the joined imposts (168); roofs shaped like spindles, turnips and pinapples, modeled in facets, network or scales; spires with windows in successive stories (175, 3); arches distorted and ogee (171; 176) etc.

Particularly, it shared the taste of the East for abundant reliefs, complicated and treated with current or covering ornamentation, modeled on the flat like that of goldsmith's work and producing the appearance of monumental tapestry (169; 178).

Its polychromy had dominant red, white and green, which it harmonized in the Persian, or contrasted in the Mongol fashion; further, it wished to dazzle by a covering of reflecting materials and by a show of richness. In spite of the rigor of the climate, the external surfaces were stuccoed and painted, and the domes were adorned by vivid colors or shone with the gleam of gold or silver. In the interior were only frescos and mosaics.

The ornamental repertory comprised geometrical combinations of Finnish invention; motives in the Armenian taste, borrowed from the art of fabrics -- braids, interlacings, mats and twisted fringes; very conventionalized foliage, dry and serrate, quite analagous to those of the Syrian school (page 67); flowers -- notably roses and shrubs in the Persian style, fanciful animals of entirely oriental appearance (169; 178).

In style as in inspiration, frescos and significant mosaics were thoroughly Byzantine, imitated from types developed in the monasteries of Mt. Athos (pages 61, 66). The walls of c

centain ancient churches -- such as those of S. Dimitri at Vladimir, of S. George at Jouriev-Polskij, exhibit figures and monstrous animals, sculptured in weak relief and out of scale, in the Armenian taste or even the Romanesque (169).

Part II. Servian and Moldo-Wallachian Architectural Styles.

Section I. Servian Architecture.

I. Requirements. -- Monumental Chronology and Topography.

From 1165, the date of the establishment of Servian unity by Stephane Nemanya, until the middle of the 15 th century, the era of the definite submission of Servia to the Turkish yoke (1459), the piety of the princes and of the great paid the cost of construction of a good number of churches and monasteries in Bosnia, in Servia proper, on the one hand, and on the other in Albania and Macedonia, three-fourths conquered by them.

That commenced in the decline of the 12 th century by the orders of Stephane Nemanya (1165-1195), as recalled by the Royal Monastery (Tsarka Lavra) of Stoudenitza (1190). At the beginning of the 13 th, Stephane I (1195-1224) erected at Zitcha the Church of Ss.Peter and Paul(1219). Then architecture profited by the progress of Servia under the government of Ouroch the Great (1242-1276) -. Monastery of Gradatz, Church of Arilje, and again under that of Miloutine (1281-1321), a building prince, who is said to have built or restored forty churches -- Monastery of Gratchanitza near Üskub; of Trescavetz near Prilep; churches of Nagoritza near Koumanovo, the B Bagniska near Mitrovitza (1312-1316). It proceeded likewise in the time of Stephane Ouroch III (1321-1331) -- Monastery of Detschani betweey Ipek and Prizrend, and particularly in the time of Stephane Douchan (1331-1255), who carried Servia to the climax -- Monastery of Ss. Archangels at Prizrend; Churches of Mateitza near Koumanovno; of Liubotin near Uskub (1337); Church of the Monastery of Marko near the same city (1345); Church of the Virgin on an island of Lake Prespa (1345).

After the death of Stephane Douchan, Servia passed into decadence, torn by internal struggles and pressed by the Ottoman expansion; thus the demand was confined to Servia proper, which owed to its northern location its shelter from Turkish attacks, longer than Macedonia and Albania.[1] From that epoch date the Churches of Ravenitza (1381); of Kurczevats, built by czar Lazare (1371-1389); of Lioubostinja (end of the century); of Manassia (1407), of Roudenitza and of Kalenitsch (

(1427), works of czar Stephane Lazarevic (1389-1427).

Note 1. Yet we find the mention of the erection of a Church at Zooum on Lake Ochrida (1361), and at Emporio near Korytzo (1390).

II. Conditions. -- Influences. -- Epochs.

Influences.

The architecture of Servia was subject to form influences; those of Byzantine, Lombard-Romanesque, Armenian and Ottoman arts.

The first resulted from the intimate political and religious relations with the Byzantine world -- marriages of sovereigns with Byzantine princesses, [1] Byzantine education of the clergy, nearly all of its dignitaries being trained at the Monastery of Ghilandari on Mt. Athos, this was more energetically exerted in the decline of the 14 th century by reason of the contact of Servia with the empire, from the fact of i its expansion in Albania and in Macedonia. Because of their proximity, the churches of Salonica and of Athos served as m models.

Note 1. Those of Stephane I with Eudoxia, daughter of Alexis III, and of Miloutine with a daughter of Andronicus II Paleologus.

The second, which affected Bosnia and Servia proper [2] in t the 12 th century, the 13 th and the two first thirds of the 14 th, was favored by the economical and intellectual radiation from the ports of Dalmatia -- Zara, Spalato, Ragusa and Cattano -, and by the politics of the Nemaynes, who were careful to avoid a Byzantine protectorate and coqueted with the Papacy. [3]

Note 2. Particularly, see Stoudenitza, Detschani and Zitcha.

Note 3. Note the conduct of Stephane I, who was raised to become king, and was crowned in 1217 by a legate of the Pope, and in 1222 by his brother with a diadem sent from Constantinople !

The Armenian intervention resulted from both the monastic relations [1] between the Danubian provinces and the native country of S. Gregory the Enlightener, and from the Armenian i immigration into southern Russia, Poland and Moldavia (page 85).

Note 1. S. Sava (1169-1236), brother of Stephane I, the f

first archbishop primate of Servia, the great builder of the civilization of his country and of his ecclesiastical organization, visited the Armenian monasteries as well as those of Syria, Palestine and Egypt.

Finally, the Mohammedan influence resulted from the pressure of the Ottoman power.

Natural Conditions.

The soil of Servia everywhere covers hard rocks; in certain regions, it offers sandstone and limestone. Wood abounds; t the climate comprises a very considerable proportion of humidity and cold.

Epochs.

In the historical development of Servian architecture are distinguished two phases, that are separated by the beginning of the 9 th decade of the 14 th century.

The former is characterized by Romanesque intimacies; the latter by the adoption of Byzantine methods for the monumental relief and ornamentation.

III. Programmes and their Realizations.

Normally, the properly Servian church rises at the centre of a consecrated enclosure, sometimes surrounded by high walls.

In Servia proper, the usual plan comprises but one aisle, [3] and if side aisles exist, they are extremely narrow (181, 1).[4] In any way, it centres the edifice by outlining a square support beneath the dome (181: 182). As high as the nave, the sanctuary ends in a semicircular apse, closed by an iconostasis and flanked by two chapels (181, 3), more frequently by two very small apses (181, 2). At first the nave was oblong
274 in the fashion of the West; [5] but in the 14 th century prevailed a grouped and radiating composition, which by means of lateral apses ended in a trefoiled arrangement, indicating B Byzantine influences (181, 2). [1]

Note 3. See Stoudenitza.

Note 4. See Ravanitza.

Note 5. See Stoudenitza.

Note 1. See S. Elias of Salonica and the churches of Mt. Athos (page 150).

If there is a narthex -- which is very rare (181, 3; 181,2) [2] -, it is commonly as wide as the church, and is enclosed in

its mass. It is exceptional that the programme provides for a bell tower, [3] otherwise independent of the edifice. The l lateral porches of the Church of Stoudenitza form an exception, indicating Western influences (181, 1; 182, 1).

Note 2. See Detschoni and Zitcho. The existing narthexes are later additions.

Note 3. See Krucevotz, where it is above the narthex.

The light is scarce, being substantially admitted by the windows of the drum supporting the dome.

IV. Construction.

In Servia, the materials are stones, split into rubble or cut in blocks, and bricks. Frequently, there is a combinatiion of rubble and bricks. Without being refined, the masonry is carefully executed. Indeed in a general way, the technics are very good.

The openings are arched in form, often circular or in rosettes
275 tes (183); the doorways are generally spanned by a lintel, relieved by an arch with solid tympanum (182, 2).

The covering consists of tunnel vaults, cross vaults, half domes, circular or polygonal calottes, raised on drums (182). The angles of the square supporting enclosure are adjusted by means of pendentives.

By reason of the comparative rigor of the climate, the vaults are sheltered by a roof of tiles with very low slopes, or by a covering of lead, placed directly on the extrados of the vaults. At Stoudenitza, the roof is masked on the facades by gables rising above it (182, 1).

V. Effect.

Servian architecture manifests taste, and in good measure, a feeling for effect, in the picturesque key. Its monuments are slender, like their Byzantine contemporaries; [1] their walls are enhanced by a substructure; by pilasters or engaged columns; by high arcades in the Armenian style; by cornices supported by arches or corbels; by splayed portals with projections; by windows coupled, tripled or in rose form (182; 183).

Note 1. See page 169. The Church of Stoudenitza is 29.5 ft. wide and extends 68.9 ft. above the ground.

276 Yet the mouldings are rudimentary and heavy, profiled in t toruses and bands, which are sometimes single, sometimes dou-

doubled with a narrow intermediate cavetto; a series of sawteeh often extends beneath the projection of the roof.

The pier usually consists of a cylinder set on a square plinth [1] and crowned by a low impost of mean outline; it is sometimes divided into small engaged columns. As for the columns, their proportions are heavy; their shafts are quite conical; their capitals are most frequently shaped as impost blocks with or without decoration by flat carvings, sometimes [2] in bell form in the Romanesque taste. The facade of Stoudenitza exhibits bases carved in the image of a lion, after a f formula dear to Romanesque Lombardy. In the 15 th century, shafts twisted in spiral form indicate a Mohammedan influence.

Note 1. See Church of Manassia.

Note 2. See Ravanitza.

Servian architecture appears strongly occupied with ornamentation. It loves marble facings. [3] It is pleased by placink abundant sculptures on the fronts of portals and the enclosures of openings (183). Its repertory only comprises a very small proportion of plant motives, very much conventionalized; elements of regularly composed scrolls, that are sometimes a animated by conventional and symbolical images of men and animals. Its favorite motives are geometrical ornaments; for example, rosettes, often very much decorated, and particularly imitations of embroideries -- laces, plaits, mats, etc., of clearly Armenian inspiration (183).

Note 3. See Stoudenitza, Detschani and Bagnisko.

In the interior, the essential factor of the decoration is fresco, treated in subject as in style according to the models offered by Byzantine painting of the 14 th century (180).[4]

See the frescos of Stoudenitza (1314), of Nagoritcho (1317) .etc.

277 Section II. Moldo-Wallachian Architecture.

I. Requirements. -- Monumental Chronology and Topograpny.

Requirements.

When Wallachia and Moldavia were formed into principalities, the former in 1241 and the latter a century later, they were already prosperous countries, enriched by the fertility of t their soil. Yet the exclusively rural civilization, thinly peopled and frequently desolated by feudal strife, and after the 14 th century by Ottoman invasions, they would not have asked the services of architecture, if they had not assigned to religion a predominating place, in accordance with the fact, that the cross became the national rallying sign against the Turks. [1]

Note 1. Even in the middle of the 18 th mentury were counted in the two principolities 260 monasteries and 18,550 religious of both sexes.

Monumental Chronology and Topography.

In Wallachia, the demand commenced at the end of the 13 th century, incited by the establishment of the capital of the principality at Courtea de Arges in 1290; from that epoch dates the Church of S. Nicolas Domnesc in that city. In the decline of the 14 th century and during the first two thirds of the 15 th, under Mircea the Great (1386-1418) and Vlad IV (1 (1456-1462), the country ruffered too much from two epochs of war against the Turks, and in the interval from one of anarchy, for it to devote itself to building. Yet Mircea the Great erected a Monartery at Cottea and the Church of S. Spiridion at Bucharest.

At the beginning of the 16 th century, a resumption of the demand was marked by the erection of churches at Bucovets near Craiova, at Targovitche (Metropolitan Church), at Tismana (Monastery of S. Nicolas), at Courtea de Arges; the episcopal monastic Church in the last city was built at the cost of prince Neagoe Bassarab (1512-1521), was consecrated in 1517, a and is both the masterpiece of Wallachian architecture and a remarkable monument. Later arose the Church of S. Nicolas at Bucharest (1598), the Cathedral of that city (1665), the Monastery of Cotroceni near the same city (second half of the 17 th century).

The Church of Radaucz recalls the beginning of religious architecture in Moldavia, about the middle of the 14 th century; in the second half of it were constructed the Churches of the Trinity and of S. John at Sereth, of Miroutz at Suczava, capital of the pincipality after 1388. In the 15 th century, t the demand increased; Alexander the Good (1401-1435) erected the Cathedral of Souczava; Stephen the Great (1457-1504), the triumphant hero of the resistance to the Turks, was a great builder of churches at Souczava, Poutna (1481), Voronetz (14 (1488), Harlau (1492), Borzesti (1493), Husi (1495), Jassi (church of S. Nicolas) etc. The first half of the 16 th century was marked by the erection of a Monastery of S. George at Suczava (1514-1522), of the episcopal Church of Roman ((1542-1550); the beginning of the 17 th century, by the construction of the beautiful monastic Church of Dragomirna (1602); the important Church of Trei Ierarchi at Ialls was built by Basile Lupul (1634-1653) etc.

II. Conditions. -- Influences.

In spite of the severity of the climate in the northern portion of the country; the small density of the population, the mediocre quality of the workmanship, Moldo-Wallachian architecture acquitted itself very honorable in its mission. It even presents some originality, especially in regard to c construction and effect.

279 Yet it reveals Byzantine, Arcenian and Mohammedan intimacies, which are explained; the first by the radiation from the religious centre of Mt. Athos, the second by reasons already stated (pages 85, 273), the latter by the Ottoman expansion.

III. Religious Programmes and their Realizations.

The Moldo-Wallachian church (185) is composed of a single nave, which in Moldavia admits of a longitudinal development relatively considerable. It comprises lateral axes, producing a trefoil shape, and normally is preceded by a great narthex with central plan, with lateral ambulatory, open or not e externally. The sanctuary is as high as the nave, and is isolated by an iconostasis screen.

IV. Construction.

The Moldo-Wallachian architects were skilful constructors. Very rarely, they built entirely in cut stone. Their ordinary

materials were rubble or bricks, connected by good lime mortar.

Their construction is characterized by the great thickness
of the walls, averaging one-fifth of the edifice; by the amp-
litude of the footings, and a strengthening by the aid of pr-
ojecting buttresses.

Particularly, it is marked and recommended by the original-
ity of its system of covering, generally realized by means of
small bricks or cut blocks of light tufa.

A first peculiarity results from a practical treatment --
the most simple of all methods known -- of an angle trumpet
of the dome on the square support, in the form of a portion
of a tunnel vault placed at 45°.

A second consists of a method of progressive reduction of
the span to be covered, whose application introduced three
expedients.

One of these is the attachment of arches to the faces of t
the area to be covered, whose masonry comprises corbelling (
(186, 1,2). Another is a division of the area by an arrange-
ment of multiple ribs. A third -- the most common -- is a v
variant of the method of the dome (186, 2,3). By means of f
four pendentives, the square opening of the interior is redu-
ced to that of an inscribed circumference. From four corbelsl
projecting at the points corresponding to the middles of the
sides of the square, spring as many arches, producing a new
square area, set diagonally to that of the ground story, and
which is furnished with pendentives, offering a support appr-
opriate for a drum supporting a circular or polygonal dome (
(186, 2). Sometimes, [1] instead of four arches, eight anr tur-
ned, which intersect and produce an octagonal opening (186,3).

Note 1. See the Church of Dragomirna.

With a view of reinforcing the bearing of the drum, and al-
so of reducing the opening to be covered, the top of the upp-
er support is surmounted by two or even three corbelled cour-
ses, whose external surface forms a parallelogram; the second
and third, a star with 8, 12 or 16 points.

In brief, the Moldo-Wallachian methods of covering are rel-
ated to the Asian system, analagous applications of which are
presented by Armenian, Mohammedan and Russian architecture (
(pages 90, 265).

V. Effect.

Lacking material greatness -- the scale of its productions was always very modest [3] -- Moldo-Wallachian architecture required the satisfaction of a very strong desire to impress by the picturesque virtues of slender stature, of an accented s shape, and of a secondary relief, diversified and even carried to oddities (186; 187).

Note 3. The Monastic Church of S. George at Suczava, which is counted among the giants of Moldo-Wallachian style, is 140 ft. long and 39.5 ft. wide. The most careful of all, that of Courtea de Arges, measures inside a little less than 82.0 ft. long by 39.5 ft. for the church, and by 42.6 ft. for the narthex. For many edifices, the length does not exceed 65.6 ft.

282 The slenderness of these churches is as striking as typical; thus in the beautiful Church of Courtea de Arges, the nave p preceding the sanctuary and whose width does not exceed 39.5 ft., extends to nearly 88.5 ft. above the pavement.

The prominence of transverse apses; a projection of the narthex beyond the line of the church; a very strong projection of the substructure; a mode of subdividing the roof into as many forms as the plan distinguishes areas in the edifice, c combine to produce a relief, both with movement and striking. The resulting effect is energetically sustained by those produced by the projections of the substructure, very projecting bands, blind arcades, flat or banded, high stalactite cornices, twisted drums, intersection of domes by windows, toothed crestings and acute endings (187).

Finally, it is often perfected by the appearance of relief ornamentation, exuberant and complicated, in which the geometrical motives are dominant, in the Armenian or Mohammedan t taste. The stalactite, in particular, is common for the shape of a capital, as well as for the modeling of a frieze; the twisted form is equally a favorite.

As for the internal decoration, painting furnished the elements.

283 Book V. Architectural Styles of southern, central and eastern Asia.

The propriety of the study in the second division of this work, of the architectural styles of Brahman, and Buddhist India, China, Indo-China and Indonesia, Thibet, Nepaul and Mongol upper Asia, and finally Japan, results from the fact, that for the two first the epoch of nativity, and for the others that of the beginning, do not precede the commencement of the middle ages. Their grouping at the end of this volume is justified by two reasons. The common originality of these s schools with relation to those, that we have just examined, forbids interference with them in accordance with the exigencies of a strict chronology. They intercommunicate more or less; those of India act upon all others in various degrees; finally, all were directly or indirectly subjected to the same external influences, those of Chaldea-Assyria-Mesopotamia, of Achemenide Persia, of Asia Hellenized by the Expedition of Alexander, of Sassanian Mesopotamia, and finally by the same countries after their conquest by Islam.[1.]

Note 1. See Volume I, pages 120, 240, 393; Volume II, pages 6, 306.

As the exploration of Asia progresses, there are multiplied the proofs of the extent and the energy of the expansion of the arts mentioned toward the East and the Southeast of the continent. See the works of MM. Marcel Dieulafoy, Foucher, Hirth, Münsterberg, and the reports of the expeditions of E. Chavannes, Sven Hedin, d'Ollone, Pelliot and Aurel Stein.

The order of presentation of these various architectural styles has been determined by a care to manifest their relative importance and their respective positions.

Because they merit it in respect to age, duration, extension and radiation, we distinguish for separate examination and
284 at first, those of India and of China, and we shall commence with the Indians, the first in date and influence.

A second Part is divided into three sections, respectively devoted to the group of the architectural styles of upper Asia, which depend on India and China; to that of the Indo-Chinese and Indonese styles, satellites of India; finally to the art of building in Japan, derived from that practised by the Chinese.

285 Part I. Architectural Styles of Brahmin and Buddhist India and of China.

Section I. Architectural styles of Brahmin and Buddhist India.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Conditions. -- Schools.

I. Requirements.

The extent and the natural wealth of India, the rare devotion of its peoples, the concurrence of several religions (Budhism, Jainism, Brahminism, worshippers of Siva, Brahmanism of those faithful to Vishnou, etc.), the luxury of the numerous sovereigns, fond of show and encumbered by revenues, the fated and rapid destriction of monuments, against which conspire a damp climate, exuberant vegetation, unstable soil, the actual carelessness of the race, the frequency of wars and of depopulation, all tend to supply architecture with multiplied and considerable demands.

By the evidence of the ruins, the secular demand must have been very small; but it is proper to recall that in the East, even when domestic construction is intended for a prince, it is not intended for duration, and that beneath the sky of India, a rlight structure in wood and bricks is eminently perishable. Rare traces of fortifications; some works of public interest; corrals, reservoirs and bridges; no tombs, unless there are exceptionally in Rajputana some commemmorative monuments (Kirtii or Jaya Stambha). On the contrary, a prodigi-
286 ous production of religious architecture, required by princes, communities and private persons, to create by thousands monuments for the purpose of reliquaries or commemmorating a religious event or a holy personage (Stupa or Tope); pillars ((Lat or Stambha) bearing symbols; sacred balustrades; sanctuaries in the open air (Chaitiya); temples, shelters of chaityas and places of worship; monasteries (Vihara); temples and chapels; monumental stairways (Ghats) for facilitating access to sacred rivers.

287 II. Monumental Chronoloogy and Topography.

Doubtless no material proof exists of the architectural production of India proper before the middle of the 3 rd century B. C. Yet the quality of the most ancient monuments known, and

also the impossibility of rendering account of certain of their peculiarities, otherwise than by the hypothesis of a partial survival of disused practices, attest the existence of a primitive art, vanished because it had built in wood under the sky of the tropics. [1]

Note 1. See what is said of this architecture in wood and crude bricks by Megasthenes, who at the beginning of the 3 rd century B. C. resided at Patna, at the court of Chandragupta, sovereign of the State of Magadha. (Bihar and grandfather of Asoka).

A rigorous chronological classification of the monuments of India is, and will continue to be opposed by the variety of production dispersed over millions of square miles; by the ignorance of the civil state of most of the monuments; by the inaccuracy of the history of the country; finally, by the difficulty resulting from the prodigious inequality of the creations of Indian art, and the frequency of restorations with a second use of the materials, for determining the age of an edifice from its style. [2]

Note 2. Dr. Gustave La Bon, who has authorized us to borrow from the admirable illustrations of his great work, Les M Monuments de l'Inde, a good number of figures of this Section, proposes the following classification:--

I. Architecture of India during the Buddhist period. (From 5 th century B. C. to 8 th century A. D.).

1. Primitive monuments of India.
   Memoricl columns of Allahabad and Delhi, temples and s subterranean monasteries of Bhaja, Karli, Ajunta etc.
2. Buddhist monuments erected above ground.
   Monuments of Bharhut, Sanchi, Sarnath, Bouddha Gaya, etc.

II. Architecture of India during the Brahmin period. (From 5 th century to 18 th century A. D.

1. Architecture of northeast India.
   Monuments of the coast of Orissa (Bhumaneswar, Juggernath etc.).
2. Architecture of Bundelkund and Rajputana.
   Monuments of Khajurao, Gwalior, Chittor, Mt. Abu, Nogda, Oudepore, etc.
3. Architecture of Guzzerat. (Gujerat).

Monuments of Ahmedabad, Palitana, etc.

4. Architecture of the centre of India.
Monuments of Ellora, Elephanta, Ambernath, etc.

III. Architecture of southern India.
(From the 6 th century to the 18 th century. A. D.)

1. Subterranean temples of southern India.
Monuments of Mahavellipore, Badami, etc.

2. Architecture of the principal pagodas in southern India.
Monuments of Chillamabaram, Madura, Sriringam, Tripetty, Conjeveram, Bijanagar, Tanjore, etc.

IV. Architecture of Indo-Thibet.
(From 2 nd century A. D. to present time).
Architecture of Nepaul.
Monuments of Sambernath, Buddnath, Bhatgaon, Patan, Khatmandu, etc..

222 From the middle of the 3 rd century B. C. until the 8 th c century A. D. developed a primary epoch of the architectural history of India, characterized by the exclusively Buddhist or Jaina origin of the demands. The evidences are rare; the most ancient date from the time, when Asoka reigned (262-225 B.C.) at Patalipoutra (Patna), capital of Magadha (Bihar), t the zealous propagator of Buddhism; these are pillars (lat) bearing inscriptions and animals, the Tope of Sanchi without its enclosure, the subterranean Temple of Rajagriha in Bihar, and the enclosure of the Monument of Bodh-Gaya.

Return to the 2 nd century; the creation of the Chaitya of Bhaja and of that of Nasik in the Maharat country at the sources of the Godavery, and the balustrades of the Topes of Sanchi and of Bharaut; in the 1 st, that of the great Chaitya of Karli and the Grottos for Jaina worship excavated at Khandagiri and Udayagiri. In the 1 st century A. D. may be placed the execution of the Tope of Amravati on the lower Krichna; of the Monastery of Nalanda, the Buddhist "Monte Cassino", south-southeast of Patna; to the 5 th century belongs that of the celbrated Chaitya of Viswakara at Ellora. The most ancient Chaitya and Vihara of Ajunta are of the 2 nd century B.C.; the others were created during the first centuries A. D. Finally, we may place in the 6 th century the erection of the famous Monument of Buddha at Bodh Gaya.

After the 6 th century, the restoration of Brahmanism determined a revival of fervor, and therefore an increase in religious demands; at the same time powerful and prosperous empires were formed in Deccan as in northern India.

The first half of the 7 th century marked the climax of the state of Kanaudji, whose territory extended from Nepaul to N Nerbuddah, whose capital of the same name appeared to them " "unrivaled", but was conquered by the Mohammedans of the 12 th century. About the same epoch was formed the state of Orissa, in which Neo-Brahmanism required temples by hundreds, notably from the 9 th to the 14 th centuries; the great Temple of Bhuwaneswar, erected in the 9 th and 10 th centuries a and restored in the 12 th and 13 th; the "Black Pagoda" of K Kanarak; Temple of Vishnu Jagganatka (Jaggernaut) at Puri; T Temples of Djaipur and of Katak, datable in the 11 th century. We further cite bridges, like that of Athara-Nala, contemporaneous with the 13 th century and still in use.

The Mohammedan conquest, which was completed in the 16 th century by the occupation of Orissa, arrested the development of Brahman architecture in Gangetic India. At the end of the 16 th century, when the intolerance of the conquerors diminished, occurred a revival, marked by the erection of edifices like the Temple of Brindabam,north of Madura (end of 16 th c century), or that of Viceswar at Benares (18 th century).The domestic requirements of some spared princes are recalled by palaces, like those of Khumba Rana at Chitor (second quarter of 15 th century); Gwalior, built by Man Singh (1486-1518); Oudeypore, the work of Odayasingh (third quarter of 16 th century); Datya and of Uncha, constructed by Bir Singh Deva at the beginning of the 17 th century; Amber (first half of the 18 th century and of Dig (middle of the 18 th century).

From the 1 st century B. C. till the 5 th century A. D., b but particularly during the two first centuries A. D., the inhabitants of the elevated valley of the Indus, the seat of t the realm of Gandhara, were fervent adepts in Buddhism; they erected important monasteries, of which the two best known a are in ruins, at Jamalghiri and at Takht-i-Bahai near Peshawer.

Likewise in the valley of Cashmere, there was from the 6 th to the 11 th centuries a swarm of monuments, monasteries and

temples; as an example may be cited, as dating from the middle of the 8 th century, the Sanctuary of Martund east of Islamabad, the ancient capital of the valley.

Yet the centre and the west of northern India did not remain behind the eastern portion. In the 10 th and 11 th centuries, Khajuraho, capital of the Chandella princes, was covered by temples, some being Jaina (Temples of Pariswanath and of Ghantai), the others Brahman (Temples of Kandarya and of Mahadeva). In the region of Guzerat, particularly in the peninsula of Kathiawar and in the south of Rajputana, were multiplied the Jaina temples; on the one hand, at Satrunjaya near Palitana (11 th and 16 th centuries), and at Girnar (12 th c century); on the other, at Mt. Abu, where Temple Vimala dates from the 11 th century and Temple Tejahpala from the 13 th; at Chitor, where is seen a Triumphal Tower of the 15 th; at
231 Ranpur, whose Temple was erected in the 15 th century and is most remarkable. Let us add a considerable group of tombs of princes erected at Oudeypore after the 16 th century.

Considered after the 6 th century, Deccan sustains a comparison with continental India.

There may be distinguished a primary epoch before the 10 th century, during which important demands were made by the Pandya princes, who reigned in the eastern extremity of the peninsula with Madura as capital; by the Pallava princes, who f from Kanchi, now Conjiveram, governed the province of Madras; by the Chola princes, who held the country between Madras and Caveri, by the Cholakya princes, who held the country between Madras and Caveri; by the Chalukya princes, whose native country was the region of Badami in the high basin of the Krichna, and who subjected to their authority the northern half of Deccan with the western half of the country between the Krichna and the Caveri. In the natural state -- still exceedingly m mediocre -- of the archaeological knowledge of these provinces, there may be attributed to this epoch certain subterranean Temples of Ellora: -- Dhumar Lena (Brahman, 8 th century), Indra Sabhai (Jaina, 9 th - 10 th centuries), that of Elephanta (8 th century); those of Badami (8 th century), the Ratha of Mamallapuram (the seven pagodas) near Madras (end of 7 th century); the Temple of Kailasanatha at Conjiveram; the cele-

celebrated Kailasa at Ellora (end of the 8 th century); and the Temples of Pattadakal. In the same times flourished the first religious capital of Ceylon, Anuradhapura, which declined in the 9 th century.

From the 10 th century to the 13 th, the demand for religious edifices was pressing. Arrived at the climax of their p power, the Chola princes, established at Conjiveram, notably constructed the Pagodas of Tandjore, of Chidambaram (10 th to 11 th centuries) and of Srirangam (12 th century). The Ballala princes, whose authority radiated from Mysore to the northern frontiers of Deccan, were lavish with orders for religious architecture; Temples of Ittagi in the district of Haiderabad (1 st half of the 11 th century), of Lakkundi (11 th century), of Lakkundi (11 th century), of Belur, of Hanamkonda (12 th century); of Somnathpur south of Mysore (13 th century); of Halebid (13 th - 14 th centuries), and Jaina Temples at S Sravana Belgola. This epoch was also that of the greatness of Polonnaruwa, the second holy city of Ceylon, particularly active in the second half of the 12 th century.

A Mohammedan invasion, contemporaneous with the second decade of the 14 th century, abolished the native states and caused a momentary depression of the structural abilities of t those countries; but soon the country south of the Krichna recovered possession of itself and established new native realms, at least as favorable to architectural production as t their predecessors. That of Vijayanagar, whose prosperity c culminated in the first half of the 16 th century, paid the cost of edifices as magnificent as the Temple of Vitthalaswamin in itr capital, and that of Tadpatri. The domain of the Nayyak princes, which comprised the south and southeast of t the peninsula as far as Madras, was covered by splendid monuments, especially in the 17 th and 18 th centuries; we shall cite the greater portion of the groups, that form the Temples of Madura (17 th century), of Srirangam (17 th - 18 th centuries), those of Vellor (15 th century), of Perur (18 th century), of Rameswaram (15 th - 18 th centuries), of Kombakonam etc. The very curious Jaina Temples of Mudbidri in Malabar date from the 15 th century.

III. Physical and Human Conditions. -- Influences. -- Schools and Epochs. -- Radiation.

Physical and Human Conditions.

With regard to the natural conditions, aside from a regime of tropical rains and instability of the soil of certain regions exposed to earthquakes, Hindoo architecture was rather favored. Stone materials abound in all India; sandstone predominates, but there are also marble, granite and basalt; forest resources were formerly as remarkable with regard to quantity, as they are still in respect to quality; particularly teak and sandal are magnificent woods.

Finally, the terraced relief of the western regions of the peninsula south of Nerbuddah, and its geological composition with thick layers of stratified sandstone were particularly propitious for the development of rock-cut architecture.

Like all oriental styles of architecture, those of India d disposed of levied laborers, as docile as abundant. Yet the importance and the difficulty of many undertakings, the scientific construction of certain monuments and the profusion of ornamentation, which characterize all, imply the employment of very numerous professional workmen, well equipped with tools [1] and highly trained.

Note 1. Indian steel was celebrated.

The existence of Hindoo treatises on construction, [2] whose composition is not without merit, announces a thoughtful and methodical conception of the art of building. Still Hindoo architecture was strongly affected by the mysticism and the inertia essential to the natural temperament; to the first a are to be imputed certain singularities in the form of edifices, and likewisetheir abundant and strange ornamentation, while the second was the cause of a routine fixity of procedures and of a rapid arrest of the development of the styles.

Note 2. Sixty four of these are known and form the collection of the Silpa Sastra; the most remarkable is that of Ram Rat, of the Dravidian school.

Influences.

Original in large measure, particularly in what concerns c carpentry, Hindoo architecture was still subjected to the energetic radiation of foreign arts; those of Chaldean-Assyrian

Mesopotamia, Achemenide Persia, Hellenizing Asia, Sassanian Mesopotamia and Persia. The influence of Mesopotamia and of Persia was exerted by the maritime route of the Persian gulf, from the most distant times, brought by the commerce of the industrious country of the Tigris and the Euphrates. That of the Achemenide civilization was further a result of the political expansion of the empire of the great kings. As for the intervention of the Hellenistic styles, this was first occasioned by a Grecian colonization of the upper domain above the Indus, or the Punjab, commenced by Alexander, and continued after him by Hellenic princes (kingdom of Gandhara); then -- after the 2 nd century B. C. -- by the extension of the kingdom of Bactriana, which until 90 B. C. dominated the lower b basin of the Indus and the coastal region toward Bombay. Note the presence, certainly in the 7 th century A. D., of Indian merchants in the great cities of Persia, and of Arab traders in the ports of the west coast of India.

This dependence was never absolute, and the borrowings resulting therefrom all received the strong imprint of the native genius.

Schools and Epochs.

In general and without the possibility of exactly deliminating their areas and of separating their origins, six different styles may be distinguished in the architecture of India:- Buddhist, Jaina, Hindoo or Indo-Aryan, Indo-Hellenic, Dravidian and Chalukyan.

The Buddhist style substantially prevailed in Gangetic India, in central India and in the northwest of Deccan (Tope of Sanchi, Monument of Bodh Gaya and that of Bharaut; Temples a and subterranean Monasteries of Karli, Nasik and Ajunta); but its application was made in the entire extent of the peninsula (Amravati), and also in Ceylon (Anuradapura); its chronological limits are the 3 rd century B. C. and the 6 th century A. D.

The Jaina style had as its domain Kathiewar (Girnar, Satrunjaya and Palitana), central India (Mt. Abu, Ranpuh, Oudeypore, Chitor, Gwalior and Khajuraho), and it penetrated into Bengal (Parasnath) as well as into eastern Deccan (Ellora, Mudbidri and Sravana Belgola). We know it only in its mature state,

which is contemporaneous with the 11 th century. During two hundred years it maintained a very high elevation, but from the end of the 13 th century, it entered on a phase of decadence, that was slightly retarded in the 15 th century by a m momentary renaissance peculiar to the region of Chitor. In Deccan it was combined with Dravidian elements.

The Indo-Hellenic or Greco-Buddhist style is peculiar to Gandhara and Cashmere; it was flourishing from the 1 st century B.C. to the end of the 2 nd century A.D., and it lasted until the 5 th century.

The Hindoo or Indo-Aryan style had Orissa as its native country, where it began about the 7 th century (Bhuwaneswar, K Kanarak, Jaipur and Puri); it radiated as far as to the Himalayas, to Rajputana (Khajuraho) and in the northeast of Deccan. It attained its climax about the 10 th to 11 th centuries, and retained its vitality until the end of the 12 th. In central India, it became allied to its Jaina rival.

The Dravidian style derived its name from peoples of the T Tamil language and Brahmin religion, who employed it; its area comprised the eastern half of Deccan south of the Krichna, and all of it south of latitude 12° north. It was constituted about the end of the 7 th century, had a brilliant epoch from the 10 th to the 12 th centuries, and a second one in t the 17 th and 18 th centuries (Mamallapuram, the "Seven Pagodas", Conjiveram, Tandjore, Chidambaram, Srirangam, Madura, Vellor, Perur etc). The Kailasa at Ellora attests its expansion toward the northwest.

From the Dravidian style was detached about the 10 th century that called Chalukyan, from the name of the dynasty, which favored its progress by itr commissions. Native in western Deccan about 16° north latitude (Dharwar, Badami), it flourished during the 11 th, 12 th and 13 th centuries in the northeast of the peninsula (Hanamkonda and Worangal), as well as in Mysore (Halebid), and it was in full advance at the beginning of the 14 th century, when the Mohammedan invasion interrupted its career.

Radiation.

The architectural styles of India radiated afar over the c countries conquered by the ardent apostolate of its Brahmin

and Buddhist missionaries, for which it became a holy land, the aim of pilgrimages and the choicest domain.

Indian art penetrated into Nepaul by the routes opened toward that country by the elevated valley of several branches to the left bank of the Ganges (page 362); into Khotan, Kachgarie, Chinest Turkestan, Mongolia and Thibet, across Nepaul, and particularly by the passes into Cashmere, Afghanistan and Russian Turkestan (page 368); into Indo-China through Assam and by the sea route, whose monsoons favored the custom (page 374); into Indonesia by sea (page 379); into China by the maritime route, by upper Burmah, Nepaul and Thibet, and finally eastward through upper Asia (page 334); into Japan by the mediation of China, and by direct action in a certain measure. (Page 422) (188; 189).

30/ After the success of Islam and the establishment of the conquerors had caused the advance of a new Indian architecture, this remained for a long time subject to the native esthetics, from which it was never entirely freed (page 208).

Even the art of Mohammedan Persia borrowed from that of Brahmin and Buddhist India (page 206), which in their turn drew from other Mohammedan schools (page 223) and from that of Russia (page 261).

Chapter 2. Programmes and their Realizations.

I. Secular Programmes.

The Indian house is of the oriental type; it turns its back to the world, comprises ordinarily but one story, and is distributed in a square plan around a central court; that is often bordered by a cloister, on which open the halls and chambers. The doorway is at the back of a vestibule verandah, d defined as the facade by widely spaced piers.

The representations of houses of the ancient epochs, presented by works of sculpture and painting, clearly indicate that their elevations comprised loggias, covered balconies and belvederes.

The programme of a palace was merely a development of that of a private dwelling; on an eminence of the ground or on a built terrace dominating natural or artificial bodies of water; behind blind facades, which for the greater part of their height had their upper zone furnished with loggias, covered balconies, and terminated by pavilions, rooms of moderate dimensions were arranged around courts with porticos. (196).

Fortification was entirely rudimentary, limited to a rectangular enclosure and not flanked, sometimes preceded by a moat filled with water. In fact, the walls were of well cut stone, but were only the natural complement of natural means of defence, that were obtained by the choice of a high and steep l locality.

As specimens of works of public interest, we cite numerous artificial lakes -- that of Oudeypore is typical -- which form precious reserves of water for the period of dryness; bridges, like that of Athara-Nala in Orissa (13 th century), which is 257 ft. long and is composed of 19 arches with spans of 6.9 to 15.8 ft. each.

The tomb of the type shown by the Necropolis of Oudeypore consisted of a substructure surmounted by a sort of kiosk with small columns and a dome, erected on a circular or square plan (125, 17).

As a realization of the memorial monument may be cited elegant triumphal arches (216, 2,3), as well as lofty and slender towers in stories, elevated on a platform and terminated by a lantern, reached by a stairway; such was that of Chitor,

erected by king Khomba in 1440, and which reaches 130 ft.

II. Religious Programmes.

Buddhist Programmes.

Buddhism required commemmorative monuments, sacred areas, reliquaries, sanctuaries, temples and monasteries.

The lat or stambha was a pillar or column marked by an inscription and terminated by an animal or a group of several. (199, 2,3; 209).

The circular enclosure of a sacred area consisted of a series of isolated pillars, like the fashion in Ceylon, where a circle of them was repeated two or three times, or according to the custom of India, connected by railings like a wooden fence; at Sanchi their height was 9 ft.; at Amravati they attained 14.4 ft., and at Bharaut 21.3 ft. The enclosure was interrupted at the cardinal points by a sort of projecting drums, with opposite entrances, whose exterior was indicated by a portico termed toran, and shaped as if it were a work of carpentry, the posts frequently much exceeded the lintel and were joined at regular intervals by a sort of architrave projecting laterally from them, and which were themselves connected by vertical supports. At Sanchi, the northern toran extends up to 34.4 ft. and its greatest horizontal dimension is 19.7 ft. (220).

The tope or stupa belonged to the category of built tumuluses. A circular platform was accessible by two ramps and supported a hemisphere of a smaller diameter, flattened and surmounted by a cube, above which in stories and spaced above e each other were three horizontal disks of stone (chatra), representations of umbrellas, which are emblems of sovereignty in the extreme East. The interval between the perimeters of the dome and of the plinth formed a walk, utilized by processions (197; 220).

The Tope of Sanchi, which may be taken as a specimen, was 55.8 ft. high, or 61.0 ft. including the plinth; the disks m measured 6.6 ft. in diameter with a thickness of 2.2 ft.

There exists at Bodh Gaya a variant of the type of the tope, that we have just presented; the plan is square; the monument having the shape of a frustum of a stepped pyramid, surmounted by a sort of a high pinnacle; it is repeated in reduced f

form at each angle of the plinth (198).

The Buddhist temple was an oblong room, preceded by a lower vestibule and terminated by a semicircle; at the centre of t the latter rose a miniature tope called a dagoba, exposed to the light introduced through an opening pierced in the upper part of the facade. These edifices were built under the open sky at Sanchi, Ter and Chezarla in Deccan and are small, [2] t
305 the preliminary hall being a little larger than the chapel i itself. Among those modified by excavation, some have larger dimensions, [1] and a more complicated plan. A concentric colonnade in the interior divides it into a central nave and two narrower side aisles, connected by an ambulatory. If there be taken as an example the great Chaitya of Karli, it is observed that the sanctuary was closed at the entrance by a screen, rising to not quite the middle height of the elevation, and being pierced by a middle and two smaller side doorways. Before them extended as wide as the nave and higher than it, but of small depth, a vestibule enclosed outside by two great piers and with four great rectangular openings alone. The l light admitted by them into the porch passed through the great opening above them and fell on the dagoba. Before the facade and on the axis of the side aisle rose a pillar supporting f
306 four lions looking outward from each other (199; 200). In brief, an arrangement singularly analagous to that of a Christian church.

Note 2. From 14.8 to nearly 26.2 ft. long, 8.8 to 11.8 ft. wide.

Note 1. Dimensions of the great Chaitya of Karli:-- length 121 ft.; width 45.0 ft., 24.5 ft. for the middle aisle; the vestibule measures 51.2 ft. wide with a depth of 14.8 ft. T The pillars are 37 in number, 7 of these in the colonnade of the ambulatory.

The Buddhist monastery (vihara or sangharama) was realized in various ways. In the Gangetic regions, courts were arranged in the interior of an enclosure well provided with shade and basins; around them rose even four stories of small cells; in southern India, the cells were hollowed in the fronts of
307 rectangular terraces successively receding; an arrangement w whose memory was retained by the pyramids crowning the Dravid-

Bravidian temples (201, 1). A monastery of Gandhara combined four parts; a sacred court with a tope at the centre and niche-like chapels around the perimeter; another in which were grouped miniature topes; a third was bordered by cells for h habitation; finally a square room for assemblages and repasts. (201, 4). In regions where architecture was excavated in the rock, the vihara was subterranean, composed of a vestibule - verandah, a columnar hall, with sometimes numerous cells, and finally a chapel, that sometimes had the proportions of a true sanctuary; such, for example, as Vihara No. 16 at Ajunta, whose hall measured 72.2 ft. square, its ceiling being supported by 20 piers (201, 2,3).

Jaina and Brahman Programmes.

The plans of Jaina and Brahman temples are characterized by a reduction of the sanctuary to the proportions of a very small chapel with square plan and designed to shelter a sacred image; generally planted in the centre of a court, this shrine is preceded by a vestibule, that sometimes succeeds a porch.

Jaina Programmes.

A Jaina programme comprises on the one hand, the erection of a square sanctuary on a square plan, preceded by a hall a and a great porch, both open and columnar; on the other, the erection along the internal sides of a rectangular enclosure, of little cells occupied by statues and of single or double porticos. [1]

Note 1. At Temple Vimola on Mt. Abu, the court measures 126 × 74 ft.; the cells are 52 in number; the porch consists of 48 columns, the vestibule is about 16.4 ft. square, and the sanctuary is nearly 6.6 ft. square.

In southern India and under the influence of the Dravidian school, the verandah and the porticos were suppressed, and the chapels of the perimeter were replaced by shallow niches; this type is known under the name of basti. Sometimes the s simplification was carried farther, and what is called a betta was nothing more than an enclosure with a great statue at the centre.

The Jaina lat was surmounted by a lamp.

Brahman Programmes.

The Brahman temple was realized in three different plans,

the first being peculiar to Orissa and central India, the second to eastern Deccan, and the third to western Deccan.

The Hindoo formula of Orissa comprised; substantially a little sanctuary (vimana or bara dewal) and a vestibule (jagamohan), generally rectangular; secondly, before and on the axis of the rooms before mentioned, a hall for dances (nata mandir)
329 and a refectory (bogha mandir). The group occupied the centre of a rectangular court, accessible by ornamented doorways. (203; 204, 1). [1]

Note 1. The external enclosure of the Temple of Jagganatha at Puri is a square of 656 ft. on each side, the internal enclosure is 395 ft. square; as for the temple proper, it extendes to 315 ft. with a maximum width of 79 ft.

When realized by excavation in the mass of a hill, like those seen at Ellora (Dhumar Lena) and at Elephanta, the Brahman temple tends to the repetition of its arrangement in the open air. Beyond a verandah, a great columnar hall -- it measures about 148 ft. square at Ellora -- representing the sacred court; an equivalent of the vimana was either formed by an apsidal chapel, or rather by a small structure behind the plan. The hill was sometimes cut vertically on three sides in order to light the interior (193; 204, 2,3,4).

Of the Brahman religious programmes as realized by the Dravidian school, two great variations are known.

The most ancient is represented by the Kailasa at Ellora or again by the Kailasanatha of Conjiveram, requiring a court w with monumental entrance (gopura), an enclosure of chapels,
330 a central sanctuary with square plan, sometimes isolated in the midst of a larger cell by an ambulatory (pradakshina), a great columnar porch (mandapa or mantapam), and sometimes with a vestibule (ardhamantapam) before the two; besides, when Siva was the deity of the place, a pavilion to shelter the i image of the bull Nandi.

The completed formula multiplied the annexes and dependances; various chapels; a hall (choultry) with a "thousand columns", destined to shelter the pilgrims; pillars supporting s statues or emblems; sacred pools, surrounded by basins on terraces, which were sometimes enclosed by colonnades; porticos or galleries along the enclosing walls; dwellings for the pr-

priests and dancing girls; bazaars. It further required triumphal gateways pierced in great rectangular masses, covered by tall pyramids (gopuras) and whose volume exceeded that of the sanctuary. [1]

Note 1. The Temple of Vishnu at Srirangam measures 2820 × 2515 ft. The external enclosure -- the seventh -- is 236 × 177 ft.; the sanctuary is about 128 ft. long, about one half of the vimana and the remainder of the mantapam.

Like those of Egypt, Brahman temples lend themselves to a development by the repetition of elements, inside the larger and larger enclosures, concentric with the primitive one, with a symmetrical location of the gateways; hence the sanctuary was at the intersection of grand avenues, marked out by a series of monumental portals, whose proportions were increased by the Dravidian school as they were more distant from the centre.

As for the Brahman temple of the Chalukyan style, its plan developed the succession of a vimana, an ante-hall and an external vestibule; it announced a marked taste for a cruciform or star-shaped arrangement of chapels opening toward the sanctuary; a pavilion for the bull Nandi, a court sometimes bordered by chapels, and a monumental entrance, composed the plan. (207; 208).

It was not rare for two temples to face each other; sometimes -- the ruins of Halebid offer an illustrious example -- they were placed beside each other.

The ordinary orientation was from east to west, the entrance being opposed to the rising sun.

Chapter 3. Construction.

I. Materials.

When the ground favored this, Indian architecture freely required the execution of its religious programmes by the art of the miner and the quarryman, further practised by surprising workmen. For them it was play -- attested by the subterranean chaityas and viharas of Karli, Ajunta, Ellora etc. -- to open the front of a precipice as a portico, and to excavate in the depths of a mountain spacious verandahs, vast columnar halls, chapels and cells (193; 200; 201; 204). on the o other hand, the prodigious Kailasa of Ellora shows that they were no more embarrassed by realizing in the open air a monument by removing and sculpturing the work (209). [1]

Note 1. To realize the Kailasa of Ellora, there was excavated in the mass of a hill a rectangular court 275 ft. long, 158 ft. wide and 105 ft. deep; there was reserved at its centre with singular certainty, material for the body of a temple extending lengthwise more than 98.5 ft. and rising to 92 ft. from the ground, arranging chapels, flights of steps, a pavilion for Nandi, porticos, a triumphal gateway, two lats and two colossal elephants, and the mass intended for the temple was hollowed internally into a sanctuary, a vestibule and a columnar porch 1. See further the Ratha of Mamallapuram.

For a long time, Indian construction only employed wood, a and doubtless earth and cruce bricks. About the 3 rd century B. C., construction in burned bricks and in stone became customary.

Bricks were very well made, and stone materials were cut p perfectly, the latter were frequently of great dimensions, e even when they were of granite, as often the case in the eastern and southern regions of the peninsula. [1] Great use was made of cement and of terra cotta in the preparation of the sculptured ornamentation of edifices. In the 16 th century, the influence of Persian art introduced the use of ceramic f facings. [2]

Note 1. Thus the southern gopura of the Temple of Srirangam exhibits monolithic jambs in granite 39.5 ft. high and lintels 23.6 ft. long.

Note 2. See the Palace of Gwalior.

Iron was much used, forged with a master's hand by extraordinary artists, capable of surprises, like that of making a solid column measuring more than 23 ft. in height with an average diameter of 1.6 ft; [3] they even knew how to protect a metallic beam from flexure by increasing its depth from the ends to the middle. [4]

Note 3. Such are the dimensions of the triumphal column, probobly erected in the 5 th century A.D., which still rises 22.2 ft. obove the floor of the Mosque of Koutab at Delhi.

Note 4. The beams supporting the ceiling of the vestitule of the "Black Pagoda" of Kanarac (10 th - 11 th centuries), whose lengths are from 19.7 to 23.0 ft., are 7.9 ins. deep at the ends and 11.0 ins. at the middle.

II. Procedures.

Indian carpentry was very expert, skilful in framework and in the construction of great tunnel vaults; it proceeded substantially by piling up timbers, never strengthening by the artifice of triangular frames, but reinforced by diagonals.((211, 2). [5]

Note 5. See the arrangements in stone in Jaina construction (212; 213, 6).

Construction in bricks was very careful, connected by clay mortar; that in stone being very well set dry. It was believed that the protection of both from earthquakes and from injury by tropical rains was ensured by giving a considerable thickness to the walls, sometimes being enormous, such as that at least 4/10 of the mass of the edifice was reserved for the solids; the precaution was further taken to connect the blocks by iron cramps.

A typical trait of Indian construction is the application made of stone materials to methods adapted to wood. Not only were they pleased to double the facade of an artificial grotto by a wooden front with wooden ribs for its vaults -- like that to be seen today in the great Chaitya of Karli, but they likewise constructed in stone a sacred enclosure and even a portico with mortise and tenon joints, exactly as if the material had been of wood (210; 220) !

An opening was either spanned by a lintel -- either sometimes composed of a monolith, sometimes of a wooden or even an

iron beam; or an arch, formed by corbelling out the courses, and of horseshoe or foiled shape.

The isolated support was very appropriate for its functions; strong, rather stumpy -- as otherwise proper in a country exposed to earthquakes, extending widely at top and frequently in bracket form, to relieve the architraves as much as possible (193; 219, 8,9,13). Sometimes -- Jaina construction presents numerous examples -- these were strengthened at their middle by two oblique braces, set on a projection of the shaft. (212; 219, 11,12).

III. Covering.

The covering was executed in wood, metal or stone; it was in the form of a ceiling, a tunnel vault or a dome.

If horizontal, it was made of wooden beams; its span was f further reduced by the projections of strongly corbelled courses or by capitals with projecting corbels (211, 2; 213, 4).

A tunnel vault of wood was composed of a framework of curved arches with the functions of ribs and a layer of planks, which was doubtless covered by a thickness of earth. The construction of the arches indicates a complete experience in c carpentry and varied; it generally consisted of a series of curved pieces, their connections being strengthened by tenons and often further by irons at the splices; they were also made of layers of planks, whose elements were so arranged, that each found itself between two solid layers; sometimes instead of a single form, there was a group of arches in a vertical plane and connected by struts. The ordinary profile was that of a stilted round arch, doubtless chosen for its smaller thrust (200; 211, 4,7). Realized in stone, the Indian vault w was produced by corbelling the courses; its stability was extreme, the overhang of each block being more than compensated by a very long tail (213, 1,2). Sometimes for the system of a continued tunnel vault, there was preferred as more economical a series of arches on which was placed a ceiling.

On a square masonry enclosure, or on a group of isolated c columns, the Indian architects understood how to erect a dome of wood or stone. When they employed either material, their procedure was by piling up timbers or stones; in one case, t the frames becoming smaller as they were at a higher level;

(213, 3; 215, 6); in the other, they reduced the span of the square to be covered by placing slabs across the angles, rep-
318 eating the operation as often as required to enable the opening to be covered by one slab (213, 1,2). From that expedient the Jaina school derived a truly remarkable method, and by it realized a covering on an octagonal portico of a relatively considerable span, [1] with a no less happy appearance and a r rare stability; assuming a square colonnade with four supports
319 at each side, an architrave was set on their tops, and furth-
320 er an architrave connected the two opposite columns near each corner, so as to form an octagonal frame; on it was placed a second one with sides opposite the angles of the former; this was continued until the closure could be completed by means of one block. Then by appropriate cutting of the interior w was produced the appearance of a curved dome (212; 213, 5,6; 214).

1.This attained to 32.8 ft. at the Temple of Somnath; at the Temple of Vimala on Mt. Abu, the dimension was 27.5 ft.

For Indian vaults, the normal profile was that required by the method of corbelling, the curve of a stilted and pointed arch.

In monumental construction, the extrados of the stone covering served as the roof; wooden roofs were protected by a layer of clay forming a convex terrace (215, 1,2).

A roof constructed in the form of a series of pyramids characterizes the construction of Cashmere and of the region of Kanara toward Mudbidri (215, 3,16).

321 ## Chapter 4. Effect.

Indian architecture sacrificed to effect, even to injuring the appearance of its productions. Its dominant purpose was to astonish, not by greatness of dimensions -- we have noted that these were very modest -- but by the success of a feat in construction, by the arrangement of picturesque effects, and by an extravagant profusion of ornamentation.

I. Effects of Monumental, General and Secondary Relief.

It had for plans accented by the prominence of the mass of the buildings, for flights of steps, and even simple movements of the facade, a taste, of which the most characteristic manifestation is the star-shaped outline of the Chalukyan school. (207; 208, 215, 10).

The elevations are distinctly rising; the monument is generally elevated by a substructure. The Buddhist chaitya and the predravidian sanctuary are covered by a sort of reversed ship (215, (1), 1); the vimana, mantapa and gopura of the Dravidian temple are crowned by slender stepped pyramids (190; 194; 205); the principle of this arrangement was adopted by the Chalukyan style, which modified its application by truncating the mass and outlining it in steps (207; 215, 10). The tendency was again emphasized by the Brahman, Hindoo and Jaina schools, which shaped the upper portion of their edifices, sometimes as a slender frustum of a pyramid with faces curved upwards and also sometimes in plan (192; 203; 215, 5,8,9), s sometimes as a sort of cylinder with oval top, and which bears the name of sikhara (192; 203; 215, 5).

Note again the theatrical appearance, that the sacred stairways on the banks of rivers (ghat) derive from the amplitude of their proportions, from their interruption by terraces and by bastions crowned by small structures, and finally from their background of a screen of walls having the appearance of a facade and preceded by shady porticos.

One of the characteristics of Indian architecture is the c care, it has always taken for a picturesque presentation of
322 its monuments; it excels in selecting improving or pleasing
323 324 sites, elevated and isolated positions, surroundings enhancing them.

The secondary relief contributed to the same effect by the

multiplication of ascending lines, notably on the sikhara, from the surface of which project great vertical sides (192; 203); by projecting gables, festoons and flowers; by pointed pinnacles (190; 192; 196; 198; 215, 8,9; 220). The crown of the sikhara is known by the name of amalaka, and it merits p particular mention; it is the exact equivalent of a flattened and strongly ridged melon, set on a stem with hollowed profile and surmounted by a depressed dome, whose summit bears a pointed motive, quite similar to a vase (192; 203; 215, 5). Note further the outlines of blind arches, which count in the number of typical traits of Indian architecture (211; 215, 1,2).

Another category of picturesque effects, dear to the art of India, is that caused by the plays of light. They were required from arrangements of porticos or of galleries enclosed by pierced and perforated slabs (190; 194); from a very contrasted modeling of the internal and external surfaces, aiming to produce both deep cavities and strongly projecting reliefs; in that respect, simulated niches are particularly typical, and form one of the characteristics of the pyramids placed on the mass of buildings in southern India (190; 191; 194).

In the same order of ideas, it is again proper to mention the long pendant keystones of Jaina domes (214), and also to cite the enormous cornices and very projecting bosses, particularly loved by the southern schools (203; 207; 209; 217). Finally, recall the procedure already noted, of the authors of Buddhist chaityas in arranging a fall of light on the dagoba, with a view of the theatrical contrast of its illumination with t the gloom prevailing in the temple (200).

II. Effect by Relief of Details.

The Indian form of the isolated support was influenced both by a secular practice of construction in wood; by the knowledge of foreign formulas; finally, by an innate predilection f for relief with movement, sumptuous decoration and a varied appearance. In a general manner, it was that of piers rather than of columns, and its effects were not in proportion to t the effort, that it cost.

In very large measure, it depended on the styles native to Hellas and Achemenide Persia.

The schools of Gandhara and of Cashmere were exposed to ra-

radiation from the Hellenizing civilizations of central Asia, and adopted the Grecian orders, but modified their character. Cashmere has revealed columns of Doric or rather of Tuscan s-shape, placed on a base, and whose echinus is detailed in the image of bells with opposed foliage (218, 1,2); while in Gandhara has been discovered a very faithful representation of t the Ionic order and an adaptation of the Corinthian formula, that would be said to be in the Latin or Byzantine taste (218, 3,4). A capital found at Patna is related to both the type of the head of a pier or ante realized at Priene and at Miletus, and to the Achemenide Persian type; to the former by its outline and by certain details; to the latter by the sculpture on its lateral faces, of two volutes in opposed directions. (218, 5).

The imitation, if not the entirety, at least of certain elements of the Persian capital, was general in Buddhist India until about the 5 th century A.D., and many compositions of piers and columns; much later than the end of its vogue -- for example, found in the Chalukyan temples of the 12 th century -- attest that for a long time was loved the appearance of the inverted bell. The theme of the crouching bulls equally obtained the greatest success, sometimes directly adopted, sometimes differenced from the original by the choice of other animals (200; 218, 6 - 10).

The extraordinary variety of forms imposed on the isolated support by the exuberant and fanciful imagination of India, defies systematic classification. At most can be gleaned some sketches of method; a frequent shape of the capital, either as a very long cap or a group of consoles (219, 8,9,12,13); superposition of a small column on a larger one, common in t the Jaina school (212; 213, 6; 219, 12); the turning -- characteristic of the Chalukyan style -- of baluster columns in the image of piled blocks, of disks profiled as toruses and of swelled cushions, with which are frequently associated cubes (219, 3); modeling of a square pier by chamfering the angles of its middle elevation, so as to create the appearance of an o octagonal shaft between square base and capital (219, 8,13);
329 all peculiarities expressing the survival in stone architect-
330 ure, of conceptions suited to carpentry. There are again ty-

typical, the bulbous and rectangular form, that first competed with and then ousted the Persian bell (193; 219, 5); the slight concavity of the flutes of the shafts (219, 2); the taste of the Dravidian school for placing a little column before a pier as the support of a console capital (219, 14); t the erection of a column on the body of an animal (219, 10); the very ingenious solution proposed from about the 6 th century by the Buddhist and Jaina schools for the problem of harmonizing the square plan of the abacus to the circumference of the shaft; the latter is surmounted by a solid in the form of a vase, from the top of which fall long crisped and serrate leaves, or against it are placed four little winged figures, which appear to support the angle projection of the abacus (219, 1,2,7). Finally, note the fantastic and disorderly reliefs of the richest pillars of the Dravidian style; some being piles of square blocks, prisms, profiled cylinders, hollowed and roughened (219, 14); others being masked by images of elephants, of riders on rearing horses, and of modeled monsters, which appear to perform the function of a support(222).

III. Effects of Ornamentation.

Hindoo architecture brought a diseased ardor to the pursuit of effects of ornamentation.

331/332 It sought for these the materials, concealing the brick mass of a tope beneath a shell of well cut stones, and that of a temple under a covering of plaster or a facing of cement or of terra cotta; building when it had opportunity entirely in marble as on Mt. Abu, or entirely in granite as in Orissa and eastern Deccan.

The sky of India gives the color tone. Hindoo architecture lavished this. The Tope of Sanchi was entirely painted as w well as the barrier and the gates of its enclosure, the description that the Chinese pilgrim Hien Tsang gave of the Monastery of Nalanda, indicates that the columns, beams and balustrades "shone with all the colors of the rainbow", and that t the glazed tiles were polychromatic. Red predominated. Finally, on the internal walls were developed great frescos, whose remains are still preserved by certain temples of Ajunta. (221).

Hindoo architecture had a passion for sculptured ornamenta-

ornamentation, and in all the force of the term made jewelry in stone; thus it was normal for all the surfaces of an elevation to be treated as a simple field, and from the base to the top were arranged without repose successive interrupted friezes (190; 207; 212; 214; 217; 220; 222). [1] By profusion it not only compromised the monumental character of its edifices, but again created appearances of disagreeable confusion, and condemned itself to practical execution. It is always p proper to admire the prodigious variety of invention, which never repeated itself; the mastery and often the artistic qualities of a work, which -- like the sculptures of Mt. Abu -- derived from marble niceties, that one would believe to be reserved for metal (212; 214), and excavated granite as men have rarely done soft stone; finally, the marvellous beauty of certain details.

Note 1. At the Chalukyan Temple of Halebid are 10 successive friezes, each being about 710 ft. long and entirely covered by ornaments and figures; a procession of elephants numbers no less than 2000 figures.

The ornamental repertory of India comprises but a very small number of ornaments of geometrical order, such as disks, interlacings, plaits, scrolls, whirls and beads, mostly of Persian or Hellenic importation. On the contrary, there was a c considerable collection of motives inspired by plant or animal nature, of which several truly possess a symbolic value; lotus flowers above each other in the Persian fashion; rosettes and scrolls, often of extreme richness; elephants, lions,
333 tigers and horses; persons acting and playing scenes in current life, hunting, war, worship, taking the parts of heros of the sacred legends; many cavaliers and bayaderesses. Great s space was devoted to animal or human monsters, almost always grimacing. Finally, the themes of religious import consisted of holy images, particularly multiplied by Brahman programmes, and of emblems, a category to which Buddhists were restricted until the 15 th century A.D.; there was a representation of the sacred balustrade, a sort of blind arch, equivalent to the outline of a tope, the cross and the mystic wheel (swastika, chakra), the trident (trisula); the tree of life (horn), the conventionalized image of expansion like a fan of the soma or date palm, between two birds facing each other (220).

334 Section II. Chinese Architecture.

Chapter 1. Requirements. -- Monumental Chronology and Topography. -- Conditions. -- Influences. -- Radiation.

I. Requirements.

The scarcity of Chinese monuments, which is explained by the fragility of constructions in wood, the frequency of earthquakes, the absence of the idea of maintenance among the Chinese, and finally the vandalism of the civil wars, only signify that there may not have been in eastern Asia an abundant production in the art of building.

China was very early civilized, the race was always devoted, and on many occasions, a government with power and resources could multiply demands of a monumental character like those of a useful order.

The successive beginnings and vitality of several religions -- astral worship; worship of ancestors; Taoism, preached by Lao Tseu at the end of the 6 th century; the gospel of Confucius a century later; Buddhism, introduced officially in the year 67 A.D. and declared the state religion in the 6 th century, Lamaism, which is a variety of Buddhism; finally, Mohammedanism, imported into Canton at the beginning of the 7 th century and widely diffused after the 13 th century, -- have always maintained an important demand for religious edifices and for monasteries. [1]

Note 1. Travelers are always astonished by the prodigious number of pagodas, that they find in all regions of China.

Likewise secular architecture was always demanded by a wea-
335 lthy citizen class, anxious to be preasantly lodged; by an a aristocracy, interested in ostentation; by luxurious sovereigns, requiring magnificent palaces for summer and winter and imposing tombs. It was further put under contribution for t the erection of a multitude of monuments commemmorating an e event or an official or private person; for the realization of edifices of public interest, such as universities, observatories and administrative buildings; for the erection of fortifications, whose importance is indicated by the Great Wall, opposed to Tartar invasions in the decline of the 3 rd century B.C.; for the construction of bridges, the digging of canals, etc. Finally, a firm belief in a survival under condit-

conditions analagous to those of actual existence, created in all times the necessity for a funerary architecture.

II. Monumental Chronology and Topography.

To the dynasty of Hia (22 nd to 18 th centuries B.C.), Chinese annals give the honor of great public works and of important structures. Likewise for the dynasty of Tcheou (1122-1 1149 B.C.); its history mentions the execution of considerable fortifications and the establishment of architectural rules, an indication of the place then held by the art of building in the Chinese civilization; note that under the Tcheou, the propagation of the religions of Lao Tseu and of Cunfucius were favorable to religious architecture.

The Great Wall, work of the emperor Ts'in Chi Houang Ti, reveals the energy in undertakings and the constructive abilities of China in the last quarter of the 3 rd century B.C.

The epoch of Han, which began with the 2 nd century B.C. a and ended in 221 A.D., was for China an epoch of prosperity and of architectural demands; we recall the imperial Palace of Loi, erected at the beginning of the 2 nd century B.C.

The 5 th and 6 th centuries A.D. were particularly favorable to the development of the art of building as a result of the great advance of Buddhism. In that epoch, Nankin possessed a great imperial Palace, which was destroyed in 598.

Civil architecture benefited by the prosperity and spirit, that the celestial empire owed to the dynasty of Tang (618-9 906). At the same time occurred a revival of the religious
356 demand, on the one hand resulting from a development of Buddhist fervor in consequence of the immigration of Hindoo monks driven from their own country, and on the other to the introduction of Mohammedanism (7 th century).[1] The Tang epoch marks the climax of Chinese architecture.

Note 1. From the 7 th century dates the Temple of Celestial Concord near Pekin; from the end of the 8 th century, the Pagoda of Ling Kouang-Tseu. The Mosque of Holy Memory at Canton was erected in 629 and rebuilt at the middle of the 14 th century.

After a period of disturbance, the epoch of the Song emperors (960-1127) arranged for Chinese art a time of brilliant flowering southhoof the Yang-tse-Kiang.[2]

Note 2. Marco Polo has expressed in the story of his journey the admiration inspired in him by the Summer Palace, constructed of bamboos for the princes Song in their residence of Kai-fong-fou in Honan, and that the Mongols removed and rebuilt at Tchang-Tou, their capital.

Meanwhile in northern China, the Khitai Tartars came from Manchuria into the region of Pekin, and founded there in the 11 th century a capital named Yen. In the second quarter of the succeeding century, it was replaced by another city, Tchang-tseu, the seat of the Kin dynasty of the Niu-tchen Tartars. From the end of the 12 th century dates the marble Bridge of 24 arches over the Houang-ho, which excited the admiration of Marco Polo.

The Mongol occupation -- accomplished at the beginning of the 13 th century -- did not injure Chinese architecture at all. Northeast from Dolonnor at Kai-ping-fou still exist important remains of the Summer residence of the Mongol emperors. In the third quarter of the 13 th century, Khoubilai-Khan, founder of the Mongol dynasty of Yuang, built for himself near and northeast of Tchang-tou a capital, Ta-tou (Khan-balik), surrounded by strong walls with monumental gates and furnished with a great Palace (1264-1267). Monuments like the Gate of Kiu-Yong-Kouan in the Great Wall, which dates from 1 1345, show that in that epoch architecture was neither neglected nor degenerate.

The expulsion of the Mongols and the restoration of a Chinese empire by Hong-ou in 1368, founder of the Ming dynasty, was the occasion of numerous, varied and considerable works. The reign of Yong-lo (died 1424) was marked by constructions at Pekin, where the sovereign established himself in 1409, a and in the vicinity of that city; fortifications of the "Tartar city" (1420); Imperial Palace, completed in 1421; Palace of Examinations (Kung-yuan); great Temple of Heaven (Tien-t'an) 1421; Reliquary of Buddha, the Wout'a sseu; Tomb of the Sovereign, about 31 miles north of the city, the first in the Ming Necropolis. About the same time were erected north of Nankin the Mausoleum of Hiao-ling (1398), the first Ming, and in the same city the "Porcelain Tower".

Note the erection in the 16 th century of the Temple of Ag-

Agriculture (Hsien-nung-tang) at Pekin, and of that of the g goddess Kuan-yin on the island of P'u-t'os-han south of Shanghai (1581); the construction in the 17 th of a capital for t the new Manchu dynasty of Tong-King near Liao Yang (1616-1626), of imperial tombs near that city (1624), of a Palace at Moukden (1637), of the Yellow Temple (Hoang-sseu) near Pekin (1651), of a Summer Palace for the emperor K'ang-hi northwest of Pekin (end of the century). The 18 th century is recalled by the Summer Palace and the Temple erected by K'ang-hi at Jehol (about 1703); by a reconstruction, at the cost of the same sovereign, of the before mentioned Temple of the island of P'u-t'os-han (1705); by various Palaces of the forbidden city at P Pekin, by a Summer Palace northeast of the capital, the work of the emperor K'ien-Long (1636-1796).

338 III. Natural and Human Conditions. -- Influences. -- Radiation.

Chinese architecture disposed of abundant material resources; various stones; ordinary woods, and in the southern provinces, precious woods, among which was cedar; great reeds for a singularly practical use. Besides it benefited by facilities in transportation, resulting from the existence of great river routes and numerous canals; by the professional aptitudes of one of the most industrious of races; by perfected tools; also by the necessity of Adapting itself to the diversity of a contrasted climate, alternately very rainy and very warm.

Its advance was opposed by the essentially rural character of Chinest civilization, by the existence of sumptuary laws, by the moderate predisposition of the Chinese to delayed hopes and vast thoughts, and finally by a love and feeling for nature, which made them prefer the appearance of a successful garden or of a beautiful site to that of a monument.

An essential characteristic of Chinese architecture is the monotony of its types and the fixity of its methods; these a are consequences of a thoroughly positive mental disposition; of a certain poverty of imagination, of a minute and narrow formalism, and of a traditionalism without parallel in history. [1]

Note 1. The rules established by the ritual of Tcheou ((1122-249 B.C.) for public and private structures are still

applied today !

In very large measure, the impulse of the development of C chinese architecture was native, and it always adapted to the national taste the various borrowings from foreign countries.

Without speaking of the very ancient Mesopotamian influences, if not materially proved but at least more than probable, the radiation from central and southern Asia to the extreme East was considerable. By their commercial relations with t the West of the continent,[2] and by the intermediary of the Y Yne-schi, who were driven from Kan-sou by the Huns in 165 B.C, then possessing themselves of Turkestan, Afghanistan and the Punjaub (163-60), [1] the Chinese acquired a knowledge of the Achemenide Persian formula [2] and of colonial Hellenism, which flourished in the kingdoms of Bactriane, Sogdiane, Arachosie and in Gandhara. [3] The Buddhist propagation and their eagerness for pilgrimages in the native land of Buddha, [1] revealed to them, on the one hand, the religious art of Hellenizing India and of Gangetic India (pages 296, 297), and on the other, that of Nepaul (page 362). From Sassanian Persia came models and suggestions of a decorative order. Note that communications between China and central Asia were favored by the reunion between 1280 and 1368, of the two countries under the authority of the Mongol emperors. Finally, doubtless to Insulindia, China owes the principle of construction in bamboo and the prototype of its system of roofing.(Page 351).

Note 2. These relations were established by the "silk route", which placed in regular communication Kan-sou and Mesopotomia by Gobi, Kashgarie, Turkestan and Persia. (ee page 374.

Note 1. See the mission of Tchang-k'ien, sent to the country of the Yue-tchi by the emperor Wou-ti (140-87 B.C.) and the conquest in the 1 st century A.D., of the regions of Lob Nor and Tarim by the Chinese general Pan Tch'ao.

Note 2. See the discoveries of the missions of E. Chavannes and of Ollone. (See M. Dieulafoy, Les Milieurs funeraires de Ya-tcheou fou).

Note 3. See pages 5, 296, 376.

Note 1. See the relations of pilgrimages of Fa-hian (5 th century), of Soung-Yun (6 th century), of Hiuen-tsang (7th c century), of I-tsing (7 th century); the official missions to

Magadha of Li-i-piao (643-645), of Wong-hiuen-tse (646-648 a and 657-661); the official relations of the Chinese empire w with Ceylon in the 5 th and 8 th centuries etc.

On its own part, Chinese architecture impressed those of T Thibetan Asia (page 370) and of Nepaul (page 362); of Indo-C China (page 378), where from the 3 rd century B.C., the Chin- ese were masters of Annam; of Japan (page 426), and finally of Europe, which in the decline of the 18 th century was inf- atuated with the "Chinese garden". (Volume III).

Chapter 2. Brogrammes and their Realizations.

Secular or religious, the programmes elaborated by the Chinese architecture are monotonous and rather mean.

I. Bomestic Programmes.

That of the house is determined in very great measure by t the laws, that according to the condition of the proprietor fixes the dimensions of the dwelling, the number of columns and the height of the building, and by a system of geomancy (Feng-choui), which determines the site, orientation, and the proportions best adapted to ensure to the owner the aid of favorable spirits and forces. Isolated from the street by a w wall and frequently by a court, the habitation comprises a f front portico, intended for life with friends; a rear part, frequently separated from the former by a court and reserved for domestic existence; finally the offices relegated to the rear or sides. The main building, with an open veranda extending before its facade, was often developed along the four s sides of the plan, communicating by covered corridors. There is sometimes a second story (225; 226).

An imperial palace differs from a private dwelling only by an amplitude of proportions, which assimilate it to a city, by greater dimensions of the buildings, by their elevation on terraces, often in several stories, by the height of the roof, and finally by a regular and symmetrical distribution of the elements around vast courts, accessible by gates of honor. T The entirety -- termed the purple city because of the colors of the enclosure -- forms a rectangle, within which another and concentric one limits the palace proper -- the yellow or forbidden city. This comprises halls (tien) for great ceremonies (228); buildings (kong) for the exercise of the various functions of the sovereign; mansions for the lodging of himself and his family; treasuries, archives and libraries; a temple of ancestors and other sanctuaries. Around the yellow c city are grouped the residences of the great dignitaries, officials, domestics and guards; storehouses etc. (227).

343 Written and graphical documents inform us, that about the beginning of the first thousand years B.C. and for long afterwards, an imperial palace possessed a colossal tower in several stories (t'ai), crowned by a pavilion, sometimes reached

by a spiral ramp around the nucleus; in brief, the equivalent and doubtless derived from the Mesopotamian ziggurat (229).

A sort of masonry screen (tchao-p'ing), forming a panel more or less ornamented, erected between a base and a roof, precedes the gate of the houses of notables and of official buildings, to indicate the rank of the proprietor and the purpose of the edifice.

The Chinese design their summer residences with love and s success. The garden there determines the structures, scattered in the verdure in the form of pavilions and of multiplied kiosks (page 355).

II. Funerary Programmes.

Funerary architecture in China is as strictly regulated as domestic, and it must proportion the development of the programme to the condition of the deceased. In all cases, it distinguishes two parts; one for the place of the corpse, and t the other for the performance of the funerary ceremonies. P Persons with little means must content themselves with a pit beneath a mound and an erect stone with an engraved prayer; a notable person is entitled to a miniature tumulus, to an altar beneath a pavilion, to steles set beneath a tortoise, emblems of eternal happiness, or even to antes at the ends of the wall enclosing his domain (230). Finally, an emperor is lodged in a vault, constructed under a tumulus or in the side of a hill; an altar, a temple and gates of honor succeed each other before the sepulchre on the axis of a rectangular enclosure, shaded by great trees (231).

In the matter of fortifications, the Chinese never passed beyond the elementary conception of the simple wall. [1]

Note 1. The different forms presented by the Great Wall, according to whether it rises in the plain or in a hilly region -- a wall in the first case and a slightly elevated terrace in the second -- is explained by Commander d'Ollone in t the following fashion; in a flat region, it must present an obstacle to the incursions of the nomads; in a hilly country, it both formed a rampart and a road for the rapid transportaation of troops.

In regard to civil engineering, their bridges merit mention; some count no less than 17 arches, and that forming the "Hump-

"Humpbacked Bridge"in the park of the Summer Palace at Pekin has a span of 28 ft. (238).

III. Religious Programmes.

The religious architecture of China realized religious monuments and edifices.

Among the former, which are Buddhist, there are those -- s such as the Pe-t'asseu at Pekin or the Wou t'asseu near the capital,-- which are more or less faithful representations of the celebrated Reliquary of Bodh Gaya (page 303); at the centre of an area enclosed by a balustrade and accessible by a gate of honor, a doubled square terrace supports a central p pyramid, flanked by four smaller satellites at the angles. Much more numerous are pagodas, lofty towers with 3, 5, 7, 9 or 13 stories, symbolical of the heavens, that Buddhist theology superposes above the earth, the plan is generally octagonal; [1] it sometimes varies from one story to another, at first being square, then octagonal and lastly circular (239; 241, 2, 3; 242). [2]

Note 1. It was chosen for the famous "Porcelain Tower of Nankin, whose height was between 196.9 and 229.7 ft., for a width of about 98.4 ft. at the base.

Note 2. As an example may be cited the Pagoda of Yuan Ming Yuan in the Summer Palace at Pekin.

The second category of religious monuments of China comprises altars for the official worship and Buddhist, Taoist and Mohammedan temples.

Analagous to the Mesopotamian ziggurat, from which it is perhaps derived, the Chinese altar is formed by three circular or square terraces in stories, profiled in steps, enclosed by balustrades and accessible by stairways located to face t the cardinal points. Sometimes -- as at the Temple of Heaven at Pekin -- the upper one is uncovered, sometimes -- thus at the neighboring Temple of Prayer for the Year, it is shelterd by a structure. [3]

Note 3. The Altar Yuan-t's of the Temple of Heaven, which is on a circular plan, measures 206.7 ft. in diameter at the base, 88.6 ft. at top, and extends to 230 ft. from the ground.

Taoist or Buddhist, the programme of a Chinese temple is a variation on the theme of the house, complicated by some det-

details imported from India; its elements follow in line on the main axis of a rectangular enclosure orientated from south to north, and are separated by courts. A gate of honor f forms a vestibule and gives access to a primary rectangular court; at the centre rises on a substructure the sanctuary, sheltering the holy images and generally preceded by a veranda; at the sides are found galleries and square pavilions containing bells, and towers. Behind that area is frequently f found a second, arranged in the same manner and consecrated to the goddess of Mercy; sometimes the cloisters have an upper story, divided in chambers for treasuries, workrooms and libraries. The enclosure contains besides, buildings for lodgings for the clergy, offices, storehouses, stables and gardens (233; 234).

As for the mosques, they do not include the ceremonial minaret (page 213), and their plans differ from that just analyzed only by the arrangement of a "mirhab" in the sanctuary, divided in five aisles by rows of columns.

Note that, secular or sacred, a Chinese edifice is lighted only through the doorway and by openings made at right and l left of it, at the back of the veranda.

IV. Commemorative Monuments.

The Chinese form of a memorial monument is a triumphal gate (pai lou) with three or five openings, the middle one wider than the lateral ones. This is commonly a portico in carpentry or stone, according to the formula of the Hindoo "toran" (page 302), sheltered or not by a roof; but it may also be a structure of masonry with vaulted arches, entirely analagous to the Roman triumphal arch; for example, such is that at Pekin, which announces the Temple of Confucius (236, 2).

Chapter 3. Construction.

I. Materials and Methods.

Guided by the positive and industrious genius of the yellow races, Chinese architecture knew how to adapt itself to the twofold peculiarity of a very rainy climate, very warm in summer, stormy, with a vegetation rich in woods, and in large l light and stiff reeds in the south. There results from the first of these conditions a development of the roof, that forms one of the most dishinctive traits of this school; from the second, a method of building the temple as well as the p palace and the house, of carpentry on a substructure of bricks or stone; finally, from the combination of both, a very original shape of the roof.

A Chinese structure consists of a roof, supported by a framework, whose intervals are closed by compartments in wood, of tamped earth, or of bricks (226; 228; 232; 234; 242). This building bears the name of ting in China; it comprises a construction entirely of bamboo, even at a great scale,-- for example, as attested by the Imperial Palace at Tchang-tou, w which astonished Marco Polo (page 336, Note 2).

Indeed, Chinese carpentry made proof of much skill, notably in utilizing the bamboo. Its connections are made by inserting a tenon in a mortise and by the insertion of a beam into the top of a forked post (235, 1); when it employs bamboos, these two methods are very ingeniously combined with that of cords held by pins (235, 2,3).

It was not acquainted with the truss with tie-beam,and did not stiffen the frame of a panel by the artifice of a triangle; it protected itself against the risks of overthrow and w warping by careful erection, by substituting for the single member a connected pair (237, 4,6), ensuring the permanence of angles by the insertion of wedges or the adjustment of brackets (235, 3; 237, 3; 242). The isolated supports rest on a square block of stone.

377 Yet the Chinese have always understood construction with a hard materials. In very ancient times, they employed burned bricks of very good quality, and cut regular blocks of limestone, sandstone, or even granite (229; 230; 232; 239; 244). Also early, they used regular masonry, and incited by their

practical sense, they built hollow walls, whose faces were c connected by transverse partitions. Finally, before the 14 th century, they knew how to construct correctly a radial tunnel vault, either semicircular or pointed, with openings of 23 ft. or more (224; 2365 238). [1]

Note 1. For example, see the Gates of Pekin and that of K Kin Yong Kouan in the Great Wall (224).

II. Covering.

The Chinese roof is of the type with two gutters; it amply projects from the faces of the walls so as to shelter them from the rain and sun (226; 230; 232; 234; 242); for the same reason, each gable facade is provided with a hip roof, which unites with the lower zone of the slopes (237, 1). If it is to be covered with thatch or bamboo, it is a light framework of canes. In this case, each slope is a trapezoidal panel c composed of a frame, tied at the intersections; of lateral edges forming hips, and the lower edge takes the part of a p plate (237, 2). The last, because of the method of connecting by cords, is found in a plane above that of the hips on which it is set; hence the upper ends of the rafters are raised the more, the shorter they are, so that the series of their extremities forms a symmetrical arc curving upwards. Far from d displeasing, this shape was adopted as a necessity resulting from construction, and even emphasized in carpentry after the 6 th century A.D., so that the raised angles of the roof became an essential trait of architecture among the yellow races. Indeed, this rendered the service of reducing the obstacle to the entrance of light into interiors, presented by the extensive projection of the roof. Since on the other hand, to lessen that inconvenience, the overhanging portions of the rafters were raised, the Chinese roof presents concave outlines. (234; 237, 1; 241; 242).

The heavy load of a covering of tiles set on a layer of mortar, and the heavy pressures of very violent winds constrained Chinese constructors to spare nothing, that might make their roofs strong and stable. They multiplied the points of support. Besides those furnished by the rectangular perimeter a and the projection of a series of brackets (234; 242), they arranged intermediate ones, either by placing internal suppo-

supports concentric with the former and higher than it, or by setting on transverse beams posts to support the roof, or if the hall were vast, a second series of beams bearing a second row of posts, repeating this if necessary (237, 3,4,6).[1] In brief, the section of these roof outlines a stairway, which is also freely apparent; so much the more, since in China an
353 arrangement of roofs in stories is a sign of dignity, regulated by law. In this case the zone formed by the visible part of the internal supports and of the partitions closing the i intercolumniations, presents the appearance of upper stories, and the entirety of the building either that of a series of enclosures fitted into each other, or of the superposition of volumes capable of telescoping into each other (232; 234; 239; 241; 242).

Note 1. See an application of the same principle in Phrygian architecture. Volume I, page 216.

As for the roofing proper, in modest construction it is a layer of thatch or of rows of split bamboos, placed with the concave sides up and covered by others reversed; but in all careful construction, these semicylindrical bamboos are replaced by strong tiles, at the same time that ridges and hips a are covered by pieces of pottery (234; 237; 242).

Chapter 4. Effect.

Considered in regard to effect, Chinese architecture reveals a curious duality; on the one hand being moderation, a taste
354 for order and regularity; on the other is a rage for luxury and a passion for what is varied, contrasted and fantastic.

It does not seek to strike with astonishment by an exaggeration of dimensions; for the elevation as for the plan, it l loves regular arrangements, centralized conceptions and symmetrical combinations; it accepts canonical requirements and the restraints of formulas; [1] it loves carved and wavy forms.

Note 1. See the ritual of Tcheou previously mentioned, and the official treatises on architecture published by the emperor Young Tchin in the 18 th century.

I. Effects of Picturesque Order.

Meanwhile its preferences are for the picturesque.

The general shape imposed on its productions is accented a and emphasized by their elevation on a base, frequently profiled in steps and enclosed by parapets; by their being flanked by porticos and verandas; by the development of the height of the roof, by its strong projection from the walls, by the raising of its edges, and the upward curves at its angles (225; 228; 232; 234; 2365 239; 241; 242).

Indicative is likewise the formula of the Chinese garden, with which western Europe was infatuated in the decline of t
355 the 18 th century. (Volume III). It exhibits equally the most earnest naturalism and the most artful industry. It constitutes a world in miniature, a collection of true diminutives of objects, forms and products, of which nature offers the m models; the ground being as hilly as possible, covered by rocks, running streams, cascades, varied and trained vegetation; the whole composing an irregular mosaic of distinct movement, isolated sites and restricted views. Yet a refined and subtle calculation is ingenious in arousing and impressing by contrasts; by optical illusions; by the effect of an aspect of nature, unforeseen or exciting a state of the soul, particularly with a melancholy tone; and also by the view of slight and frequent structures; bridges, piers, kiosks, hamlets, etc. (240).

II. Effects of Secondary Relief.

376 II. Effects of Secondary Relief.

Chinese architecture utilizes effects of secondary reliefs. It does not fail to border a wall by base and cornice, the l latter being often very heavy, or to enhance the surface by mouldings.and pilasters; it accents the curve of an arch by the aid of a simple or detailed archivolt (224; 230; 239). It energetically models the roof by using cover tiles, hip c covers and strongly projecting ridges; by crowning them with a ridge cresting and by tall finials; by treating its angles with motives in pottery; by supporting its projections by consoles in form of brackets, simple or superposed by corbelling. (234; 242). It again desires effect from the relief of the elements of a connection in carpentry, such as projecting ends of tenons, heads op inps and angles of fastenings. It festoons and perforates the woodwork, etc. (225; 234; 235).

On the contrary, it did not conceive for effect the form of the isolated support, which is nothing more than that of a p post. By reason of the considerable stress imposed on it, i its height is stumpy; its section sometimes is a square with the angles chamfered, but is generally circular; it is almost
377 always smooth; but ekamples of a form with abundant and deep sculptures are not wanting (234). Its base is a block with height not ekceeding its diameter. Ordinarily it has no capital, or rarely a simple square abacus; on the other hand, it frequently supports a long cap (234) or a group of corbelled brackets above each other and connected by notching, as picturesque as useful (235).

378 III. Effects of Ornamentation.

Chinese architecture passionately loves the effects of ornamentation.

And first that of selected materials; it seeks cedar and m marble, covers masonry with stucco and wood with lacker; it even came to construct entirely in bronze. [1]

Note 1. Witness the Temple of Wan cheou chan near Pekin, which is 19.7 ft. high.

It particularly likes the gleam of varnish, and the splendor of enamel; it freely practises overlaying with gold and incrusting with mother-of-pearl. It is especially lavish with facings of faience externally as well as internally, on a roof as on a wall, even on the entire roof of a monument; attested

by the "Porcelain Tower" at Nankin and the "Faience Pagoda" at Pekin.

The effect of a Chinese edifice is largely colored, so much the more that it is made brighter by its incorporation with lackered or glazed materials. Woods and stuccos are tinted,. especially with vermilion or oxblood reds and greens; the last tone is likewise given by ceramics, which also appears yellow and particularly blue. Further, certain tints possessing a symbolic value, Chinese polychromy impresses the mind at t the same time as the eyes. [2]

Note 2. Thus yellow indicates an imperial monument; again a scale of dark blue, turquoise blue, oxblood red, green and dark yellow, calls up for the faithful the five joys of the Buddhist paradise, in a Temple of Heaven, everything is blue, from the tiles of the roof, which are a tint of cobalt, even to the curtains of glass beadwork, which close the openings; a Temple of the Earth is devoted to yellow, one of the Sun to red, one of the Moon to bluish-gray etc.

Sculptured ornamentation is lavished on stone and still more on wood, which commonly has its entire surface accented by reliefs and sinkgins. Frequently the panels filling facades
35 and those of partitions are perforated (224; 225; 234; 239; 243; 244). The pottery ends of lines of tiles and the hips and ridge of the roof are richly modeled.(234; 239; 242).

Chinese decoration realized ornaments and representations. These were at first geometrical motives, notably angular frets and images of animals. Later, the fashion was for very conventional imitations of plants, such as rosettes or the lotus;
36 for arabesques of leaves in the Persian taste, for figures of men and animals in quite restricted use; and particularly for images of fanciful beasts -- dragons, unicorns, phoenixes, b birds with human heads, generally animated with a grimacing expression, the idea of which was doubtless imported from the Mesopotamian West, Achemenide Persia and Sassanian Persia. (224; 234; 243; 244).

361 Part II. Architecture in upper Asia, Indo-China, Indonesia and Japan.

Section I. Architecture in upper Asia.

Situated in the centre of the continent, Nepal, Thibet and eastern Turkestan play the parts of artistic intermediaries on the one hand between India, Mesopotamia-Persia, the Hellenizing countries of the Indus and of Turkestan, on the other being China and Indo-China.

Besides the Nepalese and Thibetan styles of architecture a are recommended by some marked and original traits, which are
362 both explained by the relative isolation of their areas, situated at a great height, in an inclusure of high mountains, and the physical, ethnic and historical conditions of their development.

Chapter 1. Architecture of Nepal.

Requirements. -- Monumental Chronology and Topography.

The elevated Himalayan valleys forming the state of Nepal are very fertile, and although difficult, the passes opened by several in the barrier of the Himalayas ensured them formerly the advantages of an important passage between India on the one hand, Thibet and China on the other. Yet within a l little canton of the upper basin of the Bagmati, with an area of about 232 square miles, was always confined the political and religious life of Nepal.

The population is Thibetan; but it received from India its religion, [1] its civilization and its rulers.

Note 1. Nepal was at first Buddhist, then Buddhist and Brahman. The two religions have not only harmonized, but have intermingled.

363 Tradition says that Asoka (3 rd century B.C.) visited Nepal, and it attributes to that ardent apostle of Buddhism the erection of the most ancient monuments of the country. It is certain, that in the 6 th, and especially in the 7 th centuries under the dynasty of Licchavis, Nepal was prosperous and covered by sacred edifices; by the testimony of the Chinese pilgrim Hiuen-tsang, who traversed it in the second quarter of the 7 th century, "monuments and temples adjoined each other."

After having suffered for centuries from the contests of c clans and religious rivalries, Nepal recovered in the second

half of the 14 th century under the government of prince Malla Jaya Stithti, who conciliated Brahmanism and Buddhism and entered into relations with Tibet and China. There resulted from these an important architectural demand, sacred and secular, which continued in the course of the succeeding centuries.

Most of the existing monuments are not earlier than the 17 th century. Indeed their materials require frequent restorations.

Patan, the capital after 630, is encumbered by monuments -- particularly Buddhist -- among which are distinguished the T Temples of Mahabuddha (16 th century), of Mahadeva and of Radha Krisna; the entirety of the palaces and sanctuaries grouped around the square of its Royal Palace (darbar) forms one of the monumental views, most picturesque and most impressive in the world. Katmandou was founded about 724, and divided between Buddhism and Brahmanism, possesses eight great monasteries and ninety-eight secondary ones; its Temple of Taleju (middle of the 16 th century) is one of the principal in Nepal. Bhatgaon was built about 865 and is entirely Brahmanic, having no less than fifteen monasteries of the first class and a hundred of lesser importance, its Royal Palace and the Temples of Changu Narayan and of Nyatpola Deval (1703) are also typical as well as singular. Pasupati-- north of the Bagmati and about 3.1 miles from Katmandou -- one of the holy places of Siva-Brahmanism, is an astonishing group of monasteries and temples, opposite which are the Buddhist monuments of Buddnath, celebrated even to the northern borders of upper Asia, at about 3.1 miles from Katmandou, and those of Syambunath in the vicinity of the same city.

Altogether, in the limited area previously defined, are counted more than two thousand religious edifices.

II. Conditions. -- Influences. -- Radiation.

The development of Nepalese architecture was conditioned by the forest wealth of the country, by the Tibetan temperament of the population, and finally by an energetic intervention of the civilization of gangetic India.

From the combination of there various influences resulted a composite style, very picturesque and original in large measure.

Its radiation was considerable, favored by the immense reputation of some of its sanctuaries and by ethnic affinities; it influenced Tibet (page 368), Burmah (page 408), China (page 340), and perhaps even India (page 320; Fig. 215, 16).

III. Programmes and their Realization.

Religious Programmes.

The Nepalese programme of the Buddhist stupa is distinguished from its Indian model by additions and modifications.

The primitive formula, an application of which is offered by the Monument of Buddnath, retained the hemispherical tumulus, faced with bricks and placed on a projecting terrace in one or more stories; but it added four chapels inserted in t the mass, facing toward the cardinal points, and destined to shelter as many figures of Buddha; besides, it composed the crown of a sort of cubical mass supporting a slender pyramid in three steps -- the image of a series of successive umbrellas of honor (page 303)(247, 1).

359 The hemisphere later received the form of a bell, crowned by a cubical block with cornice and gables, from which rose a mast supporting 13 wooden disks, regularly spaced and with diameters decreasing from bottom to top. On the last one was erected a light structure of pieces of wood and metal in form of a spindle, and terminating in a turret. [1] (247, 2). Further, the substructure became either a low portico forming a plinth, or a cubical pedestal with a niche on each side, or even a sort of open pavilion in stories.

Note 1. The analogy of the two varieties of the crown just defined, with the relief of the Chinese pagoda is striking.

360 The properly Nepalese type of sanctuary consisted of a vertical series of enclosures on a square plan, and generally s smaller upwards.

Sometimes -- witness the exquisite Temple of Krisna at Patan -- a construction in stone was on superposed terraces or porticos, the uppermost bearing a slender dome in form of a cone with curved outline, like the Indian sikhara (page 321), and others have pavilions with colonnades. [2] More frequently a structure in bricks and in wood forms a pagoda, each story of which was provided with a roof. On the ground story a portico enclosed a hall, that served as a shrine for a sacred i image.

Note 2. Note the resemblance of this Nepalese type to that illustrated in Buddhist India by the vihara in stories (201,1), and in Mohammedan India by the Tomb of Akbar at Sikandara, a and by various elements of the Palace of Fathpur-Sikri (page 126).

In both cases, it was a rule that the edifice should be elevated on a terrace, sometimes very high, profiled in steps with a stairway on the front side (248).[3]

Note 3. Note the theme presented by the Nepalese pagoda as the imitation of an Indian prototype, contemporaneous with the time, when India only practised construction in wood.(see Sylvain Levi's Le Nepal). It rather appears to us as an example of Himalayan construction, conditioned by the abundance of excellent wood. See the wooden edifices found in the valleys of Himalaya between the Sutledge and the Ganges (249). Also compare the Nepalese pagoda and those of China.

Like Indian architecture, the Nepalese erected lats (page 302) in the form of pillars of rectangular section, crowned by an expanded lotus, itself surmounted by a sacred figure.

A sort of campanile was formed by a stone portico, in the interior of which was suspended a bell, credited by native credulity with the power of driving away demons.

Note that certain temples were limited -- like the bettas of India (page 308)-- to a sacred enclosure in which were erected a statue and chapels.

As for the monastery, it was a rectangular court with its centre occupied by a religious monument, and the sides by cells.

The Nepalese house is arranged around a court, the internal facades are characterized by the projection of verandas and galleries; the external, by very pronounced corbelling of the story and by the projection of trellised loggias.

367 IV. Construction.

The favorite material of the Nepalese construction was of timber, offered in abundance and of excellent quality by the country, they likewise freely employed bricks. Still, they understood stone construction.

In the first rank of the characteristics of Nepalese architecture figures a method of marking the upper part of the fac-

facade by strongly projecting roofs, supported by numerous b brackets and ending at each angle in a recurved crocket (248). When the edifice has several stories, each one has such a roof, so that the entire appearance is that of a pyramidal hood. The analogy is still more striking, when the intervals between the supports of the roof are closed by panels.

Protection from rain was ensured by a covering of tiles or of metal.

V. Effect.

Nepalese monuments are counted among the number of the most picturesque, that exist.

Their elevation on a terrace or a stepped pedestal; the singular forms of their roofs; the varied play of light and shad-
368 ow produced by the openings of their porticos and the projections of their roofs, their pointed pinnacles and their angle crockets compose an appearance of relief with movement and c contrast, frequently with a foreign effect, sometimes slightly barbaric, but singularly energetic and tasteful.

It is also further completed by the appearance of its ornamentation. Rich to excess, it is both in relief and polychromatic. It comprises covering sculptures, marvellously wrought, detailed and incised -- whether the material was stone or wood -- as if they belonged to goldsmith's work; paintings with s splendid coloring and boldly contrasted; finally, details in bronze and overlays in metal.

The repertory comprises foliage arabesques, fanciful ornaments and figures of monsters.

Chapter 2. Tibetan Architecture.

I. Requirements. -- Monumental Chronology and Topography.

Tibetan civilization was roughed out about the middle of t the 7 th century A.D. under the government of the king of Lhasa, Sron-tsang-gam-po (629-650), and it immediately appealed to architecture. Indeed, this warlike sovereign, the author of fortunate expeditions against Nepal and China, having married a Nepalese and a Chinese princess, these being fervent Buddhists obtained the erection of a monastery in the centre of Lhasa (643), named Lhabrang, for the shelter of the holy images brought by them.

A century later, the success of an Indian missionary, Padma Sambhava, founder of the sect of Red Hats, decided the erection of a great monastery at Sam-yas, southeast of Lhasa, whose enclosure extends to a length of more than 1.56 miles.

About the middle of the 11 th century, Buddhism assumed a new advance as the result of the establishment of another Indian monk, Atica, creator of the sect of Gelugpa or Yellow H
369 Hats, in the western part of the elevated valley of the Brahmapoutra. In the decline of the century (1071) was built the celebrated Monastery of Sakya, west-southwest of Chigatse, w whose abbot became in 1270 the pope of Lamaism and tributary prince of Tibet, by the favor of the Mongol emperor Koubilai Khan. This clerical and lay organization and the generosity of the pious Koubilai Khan were the causes of an enormous multiplication of Tibetan monasteries.

At the beginning of the 15 th century, architecture benefited by the reform of the sect Gelugpa accomplished by the lama Tsong-kha-pa (1355-1417). From that time date the great convents of Gandam (1409), of Depung (1414) and of Sera (1417) -- all three being in the region of Lhasa. In 1445 was built that of Ta-chi-lum-po near Chigatse, which became the residence of Ta-chi-lama, the pope of the Yellow Hats. We further cite the important monasteries of Gyantse, southeast of Chigatse, of Ta-chi-yem-be and of Tarting, northwest of the same city; the Potala of Lhasa, the Palace of the Dalai-lama (1642); the Monastery of Lhabrong, the third in importance of all those of Tibet, erected in the extreme northeast of the country and on the frontier of Chinese Kansou. Recall finally, that

Tibet is covered by monasteries, even in its desert regions.

Although very inferior, the secular demands of the Tibetans
370 was real, determined by the needs of a population relatively carefwl to have themselves well, and ofa quarrelsome aristocracy, compelled to fostify its residences.

II. Conditions. -- Influences. -- Radiation.

Favored by the number of demands addressed to it, by the i importance of many programmes to be realized, and finally by the wealth of the Lamaist clergy, Tibetan architecture, in l large measure, was conditioned by the forest wealth of the country, by the rudeness of a variable climate, and by the o originality of the temperament of its inhabitants.

Thus in spite of important artistic inflitrations, resulting from the religious propaganda of India, and in modern times from the political predominance of China, this art has i its own very marked appearance, with traits impressive as well as characteristic.

Note that the expansion of Lamaism introduced it into Mongolia and northern China -- as proved respectively by the monuments of Ourga and of Jehol -- and that it radiated over Nepal and the northwest of Indo-China.

371 III. Programmes and their Realizations.

Religious Programmes.

In Tibet, religious architecture was required to create commemorative monuments or reliquaries and monasteries. The former bear the name of chorten and were derived from the Indian stupa (page 303).

The latter, the principal ones forming actual cities, [2] comprise a temple, a sacred library, assembly halls, a house for the abbot, and around this central group are the habitations of the lamas, distributed in quarters.

Note 2. They have five or six thousand monks.

The temple is a rectangular nave, divided into one central and two side aisles by colonnades supporting the covering; s sometimes galleries reduce the side aisles to low aisles; the altar is at the rear end and opposite the entrance. No windows; but frequently is an opening in the ceiling over the holy of holies. The programme further comprises chapels consecrated to inferior divinities, sacristies, treasuries, and on

the terraced roof is a pavilion in Chinese style, indicating the dignity of the edifice.

The Great Temple of Lhasa, that of the Lhabrong, presents a special arrangement, whose peculiarities -- the doubled sanctuary and the replacing of the covered nave by a court enclosed by porticos and corridors -- is explained by the fact, that it is both a temple and a reliquary (252).

Secular Programmes.

The programme of the Tibetan house is distinguished by a c
372 common hall with a hearth, whose smoke escapes by a lantern; living rooms; a stable and a storehouse; the chambers are frequently in a second story. When developed, the residence compriser numerous rooms, well served by stairways and corridors, and a chapel. Openings are rare and small in the facade. In wooden regions, the rural dwellings recall Swiss chalets.

The Tibetan castle (dzong) is an imposing and strong group of high and great towers on a square plan, which are sometimes dominated by a keep (253). Those of Lhasa and of Ta-chi-lum-po have a truly bold appearance (251).

The tombs of the grand lamas are high towers covered by pavilions in Chinese style.

IV. Construction.

When careful, Tibetan construction is in stone masonry; ordinary construction consists in piling up stones dry, whose crevices are filled with earth, or of a mass of tamped earth, strengthened by wooden ties. The use of stucco coating is the rule.

Walls are strongly battering, and openings are trapezoidal (254); for a covering, a ceiling is supported by a series of columns. As for the roof, it is terraced and is sometimes covered by tiles.

V. Effect.

Tibetan monuments betray a passion for effects of picturesque order.

They always derive an advantage from their location, either on a height dominating a vast extent of country, or in surrooundings of a smiling and grand nature.

373 Besides, they have from their authors the power of impressing the eye and the mind by violent contrasts of color, by

accents in relief, and by the play of light and shade; at the top of the external surfaces of the walls of the sacred edifices, at an elevation of several yards, breaks forth the violence of a zone of dark vermilion, sometimes enhanced by the yellow and black spots of the decoration of the ends of the carpentry of the roof (254); from the roofs of the monuments rises the brilliant caprice of a slender story, perforated, accented by cresting, pinnacles, upturned angles, and emphasized by gilding; particularly, the interiors of the temples, because of the obscurity of the nave, of the dim polychromy of mural frescos and hangings of embroidered silks, of the g gleams of gold lit by numerous lamps, of the strong illumina-
377 tion of the altar by the opening arranged in the ceiling, compose a wonderful and effective view, "a vision of another world".[1]

Note 1. Sven Hedin. Le Tibet devoile.

Chapter 3. Architecture of eastern Turkestan.

I. Requirements. -- monumental Chronology and Topography.

At the end of the ancient era and in the first centuries A.D., eastern Turkestan was far more populous than today. More damp, better irrigated, and by reason of the predominance of China, favored by relative security, the country east of the Pamir, south of the Thian-Chan mountains and north of the Karakorum and Altyn-Dagh mountains, contained great centres of civilization, and derived benefit from an active and regular travel between China on the one hand, India and central and western Asia on the other.

The regions of Kashgar, Yarkand and of Khotan are covered by ruins invaded by sand.[2]

Note 2. See the ruins of Yothan, east of Khotan; of Khogalik, of Kara sai, of Rawak, of Dandan-uilik, of Toklo Makan, of Toumchouq, etc.

At the stops on the route connecting Khotan with the Chinese city of Tunhuang are located cities and posts -- notably at Nya, Endert and Miran, the capital of the state of Lou-lan, on the frontiers of Lob-Nor, and the key of the communications between Lhasa and the eastern basin of the Tarim. The prosperity of these different regions appears to have culminated in the 3 rd century A.D.; about the end of the 8 th, it suffered from a decadence of Chinest power and from Tibetan invasions.

There resulted an increase of travel on the northern route connecting Tun-huang to Kashgar, and which was likewise planted with important agricultural and commercial groups; for e example, such as Kara-shahr and especially Idikutschari, southeast of Turfan, whose climax corresponds to the 9 th century and its decadence to the end of the 14 th century.

The peoples of these regions, a mixture of yue-tchi, Turkish, Chinese, Bactrian and Indian elements, professed Buddhism with fervor; they furnished numerous monks and multiplied the demands for stupas, sanctuaries, temples, monasteries and sacred grottos.[1] At the same time, they appealed to domestic and military architecture.

Note 1. At the beginning of the 5 th century, Fo-hian made a pilgrimage from China to India and passed through Lob-Nor,

and he relates that in that canton 4000 monks followed the r rule of India. At Idikutschari were recognized by dozens and dozens, sanctuaries, monasteries and grottos in the adjacent mountains.

II. Influences. -- Radiation.

With regard to art, they closely depended upon northwest I India (G.ndhara), the source of their religion, and on Hellenized Turkestan (Bactria and the Yue-tchi empire), which was the pole of their economic life. Their impregnation by the esthetics termed "Greco-Buddhist" is particularly apparent in the areas south of the Gobi, even to the frontiers of China (page 378). The influence of Mesopotamia and of Sassanian Iran is attested by the application of their methods of construction (page 377), particularly in the basin of the Tarim. The influence of China was very small.

On the contrary, the latter country wasstrongly impressed by those relatives of the "Greco-Buddhist" and Mesopotamian-Persian schools (pages 338-340).

III. Programmes and their Realizations.

In the region of Gobi, the stupa had a hemispherical form like its Indian prototype; but frequently instead of being a solid tumulus, it was a rotunda sheltering a dagoba (page 303). At Idikutschari were produced monuments elevated on terraces, in the image of Bodh-Gaya (198); most frequently being a prism with smaller ones at the angles; sometimes a central edifice was surrounded by shrines, more or less numerous (256).

The same place revealed the plan of a sanctuary, which appears original, unless it be connected with a Mesopotamian-Parthian arrangement, observed in the Palace of Hatra (6, 5A). A prism of square section, sometimes solid, containing a chamber, or furnished on each face with a niche-chapel for exhibiting a figure of Buddha, is surrounded by a corridor, which defines an enclosure also rectangular, pierced by a single g gate, or by one on each side, covered by a vault. [2] Note again the erection of oblong interiors for the purpose of temples or monastery halls, sometimes provided with niches and covered by a tunnel vault.

Note 2. Note the singular analogy of this arrangement with that offered by Burmese sanctuaries. Also page 411.

As for houses, as in China they ordinarily consisted of a building flanked by two wings.

IV. Construction.

The construction employed was either exclusively of wood, wattled reeds plastered with clay, a combination of wood and tamped earth, or linally in the masonry of crude bricks strengthened by wooden ties. A stucco, made of a mortar of clay and straw, always completed the structure. In the basins of the Tarim, burned bricks were in constant use.

These served in the construction of vaults, although the ordinary covering was a ceiling of carpentry supporting a terrace. These were erected in the fashion of Mesopotamia-Persia in the Sassanian epoch, either in the form of tunnel vaults built in slices without centering, or as domes on a square s support, connecting with the angles by the artifice of trumpets. (Pages 14, 15).

378 V. Effect.

In the country of the Gobi, effect was required by coatings of stucco and the realization of relief and especially of painted ornamentation. The visible parts of the woodwork were accented by a profusion of decorations carved in very low relief or rather sunken (258); the walls were covered by frescos.

The favorite motives of the sculptor were ornaments -- rosettes, rows of lozenges or circles, scrolls etc. -- borrowed from the repertory of of the "Greco-Buddhist" art of Gandara and of Turkestan (258). The painter frequently represented with great success figures and religious themes, as well as actual personages and genre scenes. [1]

Note 1. See the fragments brought by the mission of Aurel Stein and exhibited in the British Museum.

379 Section II. Architecture in Indo-China and I Indonesia.

The various architectural styles of Indo-Cnina and of Indonesia have an air of relationship. That occurs, without mentioning the communications between them, because all depend on the same physical, human and artistic conditions: an equatorial or tropical climate; mixed races; a brilliant economic prosperity; a dense population, where an autocratic rule and a dead season of three months in agriculture permits architecture to gather multitudes by levies; Brahman religion, more or less in competition with Buddhism; finally and particularly, the energetic and prolonged influence of India.

In fact, long before the beginning of the Christian ear, Indo-China and Indonesia were visited by merchants, adventurers and missionaries, who founded establishments and introduced civilization and diffused Brahmanism. From the 3 rd century B.C., the Buddhist propaganda increased the number of their Indian visitors. As a result, they remained in constant relations with the country, the cradle of their religion and their civilization.

There resulted from this an artistic fertilization to which was opposed an infiltration of Nepalese, Tibetan, Greco-Buddhist, Mesopotamian-Persian and Chinese arts. The second was accomplished, on the one hand, by the routes opened by the e elevated valleys of the Indo-Chinese rivers, and which were borrowed from the peoples of the peninsula, originally from eastern Tibet and from the southwest of China; on the other, in consequence of a Chinese immigration by land and sea, which was commenced by the conquest of Annam in the 3 rd century B.C.

We shall successively examine the group of Cham, Khmer and Javanese architectural styles, between which are observed in-
380 contestable resemblances; Burmese architecture, which has its own appearance; and finally, the Siamese and Laotian architectural styles, more recent and dependant on the others in great measure.

Chapter 1. Cham Architecture.

I. Monumental Chronology and Topoghaphy. -- Conditions.

From the beginning of the Christian era, [1] the eastern port-

portion of Indo-China, comprised between the Mekong, the Sea, 11 th and 17 th north latitude, formed the area of the realm of Champa, [2] whose capital was at first Ding-Duong in Quangnam, and from the 10 th century was Bink-dinh near the port of Qui-nhon. Powerful in the 5 th and 6 th centuries, tributary to China in the 7 th and 8 th, always fighting against the Khmer empire and Annam, it was crushed by the latter at the end of the 15 th century. In the time of its grandeur, Champa enjoyed a remarkable prosperity, and its wealth obtained the admiration of Marco Polo, when he visited Binh-dinh in 1280.

Note 1. The most ancient Chom inscription dotes from the 2 nd century A.D.

Note 2. The Chinesename it Lin-yi.

The Chams received from India their religion, which was Sivaic Bhahmanism and the principle of their civilization. They had relations with China and with Java.

Their architecture is revealed by ruins scattered from Donghoi nearly to Phan-thit. The most important are those of Mison, southwest of Tourane, which represent the different epochs of Cham history; of Quang-nam, Phan-rang, Nha-trang and Qui-nhon.

The period of maturity of Cham architecture began towards the decline of the 6 th century and lasted nearly three centuries: the decadence was rapid.

The Cham temples recall both the Khmer monuments of the 7 th century and those erected in Java (compare 260 with 278,1) in the region of Dieng from the 10 th to the 12 th centuries. The hypothesis of artistic communications between these countries is probable; but it is impossible to determine the direction and the mode.

II. Programmes and their Realizations.

The canonical programme of a Cham temple required a sacred area, whose rectangular enclosure was interrupted at the middle of the eastern side by a monumental gateway; a sanctuary-- shelter of the linga -- a square cell elevated on a substrucure in the centre of the enclosure, and accessible at the east, either directly or after traversing a narrow porch; an o oblong hall placed south of the shrine; finally before the e

enclosure and on the axis of the gate, a great rectangular b building, which served for assemblies, repasts or the sacred dances (260).

III. Construction.

The Chams built almost exclusively in bricks, only employing stone for lintels and for the execution of pieces of sculpture to be inserted in the masonry. They freely fixed motives in terra cotta on the surfaces.

The bricks were of excellent quality, and at least on the 362 facade, [2] were laid perfectly, so that the beds and joints w were scarcely visible. In the sculptured portions of the edifice, they were carved after the completion of the construction.

Note 2. On the contrary, the internal masonry was rather neglected.

The covering was realized by vaults with horizontal courses corbelled out, which were concealed by wooden ceilings.

IV. Effect.

Cham architecture is recommended by a marked care for the effect of the monumental and secondary reliefs.

Its monuments were elevated on a plinth, itself being above 363 a substructure, they were crowned by a pyramid in four stories, covered by a cylinder with oval termination, and the angles of each story repeated this accenting terminal, forming pinnacles; from each face projected the strong relief of a f false doorway (261).

Besides, the bases and cornices were enriched by repeated and contrasted mouldings, the vertical suffaces by pilasters, and the stories of the pyramid by niches, the horizontal edges were decorated by flowers and acroterias, at the angles w were projections analagous to gargoyles. Note the taste for outlines in pointed arches.

The Ornamentation consisted in sculptures, whose execution was satisfactory in the good period. They represented arabesques, figures at small scale of animals, men and monsters borowed from Brahman mythology -- garuda, naya and makara.

Chapter 2. Khmer Architecture.

I. Requirements. -- Monumental Chronology and Topography.

Khmer civilization developed only in the 6 th century A.D., when the principality of Sambor ((Sambupura) -- on the Mekong about 13° north latitude -- made itself independent from the kingdom of Founan. [1] It attained its climax at the beginning of the 9 th century, the epoch in which the reign of king Jayarvarman II (802-869) inaugurated for the Cambodian kingdom an epoch of power and brilliant prosperity. The centre of t the empire was then at about 156 miles west of Sambhor, the region of Tonle Sap or the Great Lake, and more particularly north of the western extremity of that expanse of water, the canton of Angkor, where arose in the course of the 9 th century the city of Angkor Thom with its walls, palaces, its Temple called Great Bayon, sacred ponds, all in ruins, but susceptible of complete restoration.

Note 1. Founan, whose area corresponded to the whole of C Cambodia and Cochin China, which had for capital Angkor-baurei on the right bank of the Mekong between Chau-doc and Pnompenh, was civilized by the expansion of India in the 2 nd century A.D. Rich and powerful in the 3 rd and 4 th centuries and in relations with India and China, at the beginning of t the 5 th century, it was completely Indianized by a Brahman named Kaundinya. It continued to flourish during the 5 th a and 6 th centuries; but in the course of the 7 th it was absorbed by the youthful Khmer state. Its population combined Khmer, Cham and Malay elements.

Thenceforth, secular architecture received numerous and important demands for royal and princely residences, fortifications and works of public interest, such as roads, canals and artificial reservoirs.

The success of the two Brahman and Buddhist religions -- t that of the second being decided about the middle of the 10 th century -- resulted in an enormous demand for temples and monuments, all the greater, because kings, notables, village communities and private individuals multiplied pious works in order to acquire "merits" for the hereafter. There may be d dated:- from the beginning of the 7 th century, religious edidifes at Han-chei, Sambor, Banteai-Prei-Angkor, Prasat-Pran-

Srei; from the last quarter of the 9 th century, Temples of Takeo, Bakong, Loley, Beng Mealea, Mt. Bakong and of Phimeanakas in the Palace of Angkor Thom; from the second half of t the 10 th, those of Ta Prom (Brahman), Banteikedei (Buddhist) and of Bapuon; from the first half of the 11 th century, those of Phnom Chisor, Vat Ek and Prakhan, north of Angkor Thom, finally, from the first third of the 12 th century, that of Angkor Vat, etc.

After the 12 th century, Khmer architecture suffered from the decline of the Cambodian empire, which was exhausted in the course of the 13 th century by unfortunate contests agaist Champa, the Burmese of Pegou, and finally the Siamese.

370 II. Conditions. -- Influences.-- Radiation.

During the three and a half centuries occupied by its career, its development was favored by the amplitude of the programmes proposed to it, by the immense resources placed at its command; by the abundance of stone materials -- a coarse but strong limonite and an excellent sandstone, susceptible of s sculpture; by the remarkable skill of its workmen, and also by the facility of transportation resulting from the regular inundation of the country during the rainy season.

The legendary history of Cambodia mentions several immigrations of Brahman Hindoos, natives of the eastern coast of India, and the founder of the kingdom may have come from Java. We stated in the course of our analysis, that Khmer architecture appears to be closely related to that of India, and that
376 it has some traits common to those of Champa and of Java. Y Yet it clearly differs from both. By certain traits, it recalls the arts of western Asia, those of Mesopotamian-Persia and "Greco-Buddhist" civilizations. After the 14 th century, it came under the influence of China.

It influenced the Burmese school and particularly the Siamese.

III. Programmes and their Realizations.

The type of city revealed by the ruins of Angkor Thom was outlined by a rectangular enclosure, orientated by its sides; from within outwards succeeded a thick rampart of earth 23.0 to 26.2 ft. in height, supported externally by a solid wall, and a moat about 328 ft. wide and filled with water. Five gateways were accessible by causeways, two -- one of which w

was a gate of honor -- in the eastern wall, the others at the middle of each other side. The internal arrangement was was crossed by two corridors; one on the axis of the bridge opened a long and narrow street (52.6 × 11.5 ft), the other formed two areas for the guards.

The Khmer palace, after the fashion of the East, was a group of offocial buildings, religious edifices, private residences, offices and storehouses. The whole occupied at Angkor Thom a rectangular enclosure 4921 ft. square, orientated by its sides and isolated by the triple obstacle of a wide moat filled with water between two walls from 19.7 to 26.3 ft. high. On the eastern front as a promenade extended a terrace, accessible by five flights of steps and surmounted by a gallery at the middle. At the rear was developed the serail; by a monumental gateway an internal court was entered, from which one passed into a vast court of honor; there was found the throne hall, reception room, offices, and at the centre being the " "Golden Horn", otherwise the private sanctuary of the sovereign, the dwelling of his divine protectors, the place of his coronation and for great ceremonies. Then was the harem distributed into a central residence for the king, a dwelling f for women, gardens and offices, the latter placed against the western enclosing wall (264).

Religious Programmes.

The religious architecture of Cambodia at first limited the temple to a shrine. [1] In the 8 th century, this elementary p plan was complicated by the addition of a projection on each side. Finally in its maturity, it elaborated three temple p programmes, to which was common the arrangement of the sanctuary, composed of a central holy of holies and a group of satellite chapels. As at the eastern Mebourne of Angkor, these were sometimes few in number and near it (266, 5); sometimes multiplied and surrounding it at a distance in the Javanese mode; [2] (278; 280); thus at the Temple of Praknan, the Bayon of Angkor Thom, or the Temple of Bakong (2665 1), where may be respectively counted 45, 50 and 96. The proportions were modest and often very small; the plan was almost always square; yet that of the Bayon was made oval with 8 projections, a porch was sometimes doubled and preceded the small structure.

Note 1. See the Sanctuaries of Han-chei.

370 One of the two arrangements just mentioned -- the Temple of Bakong and the Phimeanakas in the Palace of Angkor Thom present examples -- was entirely in height; it perched the holy of holies on the top of a truncated pyramid in seven stories, some solid and the others opende as galleries, all accessible by a stairway placed at the middle of the facade and sometimes crowded with chapels (266, 1).

A second formula was applied at Bayon and Angkor Vat, for example, and developed the theme in area as much as in elevation (265; 268; 269; 272)). Rectangular terraces arose successively receding, generally three in number and flanked by stairways on each of their sides; around their exteriors extended either galleries, lighted by wide openings with mullions and almost continuous (267; 271), or by single or double cloisters, open towards the exterior or the interior (265); at each angle was erected a pavilion dominating the filghts of steps, and at the middle of each side rose a monumental gateway, reached by a great step (265; 267; 271; 272). Sometimes -- as at Bayon and Angkor Vat -- one of the courts enclosed by the galleries of a story were divided into little c courts or into basins by intersecting and angular corridors, covered by porticos (269, 22).

As for the third type, realized at Ta Prom, Kedei etc., it comprised the transfer to a single level of the elements previously mentioned.

The entirety, which was composed by various additions, such as reading rooms, libraries, cells, sacristies and treasuries, occupied the centre of a vast area bounded by a wall, sometimes preceded by a broad moat filled with water; in its turn, the enclosure was located in a park. The outlines were concentric, and if Angkor Vat be excepted, the orientation was f
371 from east to west, the entrance of the sancturay being opposite the rising sun (268).

Religious or secular, the Khmer monuments were indicated a afar, often at more than 5/8 mile from their sites by the beginning of a straight avenue, extending along the prolongation of their main axis on a causeway or a series of columns, so that it should be above the inundations; paved and sometimes bordered by a line of steles or a parapet, interrupted o

once or more by a cruciform terrace, whose arms terminated in stairways, this causeway reaching the gate of honor, and extending beyond to the first terrace.

Finally, the necessary complement of every Cambodian programme was one or more rectangular basins (sra), orientated by their sides, and whose dimensions might reach those of a lake, even to 1.74 square miles; the banks were faced with stone, and from the western side projected a sort of flight of steps or pier, from which led the avenue of access to the monument; generally a central island bore a pavilion or a chapel (266).

Special mention should be made of the gates, which were veritable edifices, composed of a pavilion preceded by a porch and by two wings treated as galleries (271; 272).

IV. Construction.

The resistance, sometimes for centuries, of the Khmer monuments to the formidable combination of rain and of tropical vegetation attests the conscience and science of their authors.

They constructed a residence building of carpentry raised on a substructure of hard materials; they freely employed bricks, even for a monumental structure, which they made in a superior manner. They always preferred stone, which they cut in perfection, frequently in blocks of great dimensions; they utilized limonite for substructures and for parts not decorated, with sandstone for the others. They made tiles of terra cotta, and made great use of metals; lead, copper etc.

The remarkable stability of their foundations, so much more significant because of the heavy loads imposed on them, and the climatic conditions were unfavorable, attests the attention accorded to them. Their brick construction was very careful and strongly bonded by an excellent mortar. Their stone masonry was set dry, perfectly regular and so well jointed, that there is often difficulty in distinguishing the blocks. Whether of stone or of wood, the isolated supports were slender, sometimes penetrated by the end of a timber belonging to a side aisle (271; 274).

Khmer architecture constructed a covering, either by a wooden ceiling, or by a tunnel vault or dome of stone, erected in pointed arched form by the process of corbelling; sometimes the vault was visible, sometimes concealed by a ceiling (263).

Its extrados served as the roof, a careful jointing of the s stones ensuring perfect and durable resistance to water (271).

In truth, the spans were of modest proportions. [1]

Note 1. The spans of the tunnel vaults of Angkor Vat do n not exceed 10.2 ft. for a total height of 21.0 ft., and that of the arches of the bridge of Angkor Thom is only 4.26 ft. 2 ins., less than the thickness of the arches.

V. Effect.

Khmer architecture is counted with those styles, which best understood the production of effects. It aspired to, and in the largest measure, it succeeded in arousing an admiring astonishment, pleasure for the eyes and enjoyment for the mind.

It loved material greatness; devised sacred lakes 2.5 miles long, terraces covering 162,000 sq. ft. and rising 91.9 ft. high, colossal entireties, like that of Angkor Vat with its enclosing moat 3.42 miles long and 656 ft. wide, its series of structures extending without interruption for nearly 0.93 mile, its gate of honor with a facade of 770 ft., and its galleries, some reaching a length of 705 ft.

Note 1. At the Temple of Bakong are counted no less than 97.

It was again pleased to astound by the multiplication of elements; for example, erecting veritable thickets of towers a and spires. [1]

It particularly aimed at impression by an appearance of height and slenderness. It multiplied levels, raising the sanctuary to 65.6 ft. or more above the soil on a series of terraces, in fact even on a stepped frustum of a pyramid. [2] Besides, it sought to make all secondary reliefs suited to raise the eyes; rapid inclination of very steep stairways, erection of towers and domes of pointed outline, sharp terminals and pointed spires (271; 272); better still, it had recourse to artifices producing perspective illusions, such as a progressive narrowing of stairways upwards, and a symmetrical diminution of the heights of the figures placed on the steps of the strings. [1]

Note 2. At Angkor Vat, the graduated heights proceed as f follows. The area of the enclosure rises 5.6 ft. above the natural soil; the promenade is 3.3 ft. higher; the first terrace is 13.1 ft. above the promenade; the second terrace is

19.7 ft. above the first; the third terrace is 42.8 ft. above the second; the site of the Temple is 54.0 ft. above the plain.

Note 1. The height of the last figure at the top does not exceed one third of the first one at the bottom.

Khmer architecture was neither less attentive nor less skilful in producing impressions of a moral order; thus it retarded the arrival at the principal building by reducing the route of access to the narrow band of a long causeway (265), and by opposing to the visitor the obstacle of high flights of s steps and of very steep stairways (271), several times repeated.

Effects of Relief.

Impassioned for picturesque effect, it had the good taste to first seek it in the monumental order.

The general form of its productions had movement; in plan by numerous projections, by the ample prominence of flights of steps and terraces, by the projections of pavilions and portals, by the enlargement of causeways in cruciform terraces (269); in elevation by the striking relief of the terraces in stories and of stepped pyramids, by numerous towers, spires and turrets, unequal in height as in size. (266, 1; 272). Sometimes -- for example at the Bayon of Angkor -- in view of recalling Brahma with four faces, to the religious edifice w was given the appearance of a colossal human bust with four faces, orientated toward the cardinal points (263).

The secondary relief tends in the same direction. The wall was bordered at top by the projection of a strong cornice and by a series of pointed arches; its surface was accented by s strongly projecting bosses, by the projections of pilasters, engaged columns, sculptures, and by the recessed openings, actual or similuated (267; 273). The domes rose in stories or were serrated (271; 272); the extrador of the vaults was ribbed and imbricated (271). The strings of the stairways were stepped, and frequently the fronts of the steps were recessed at the bottom (271).

On the isolated support was usually imposed the form of a square prism; even if frequently without a base, it was always crowned by a capital. Both were composed of a pile of square cushions with convex edges, equal in area but not in th-

377 thickness, and their appearance recalls the Tuscan order(271; 274, 1). The shafts of the columns present the appearance of balusters of turned wood, ornamented by astragals, blocks and knobs; the capital and base are sometimes cut in the image of a square slab, sometimes in that of the corolla of a lotus. (274, 2).

Yet in the number of characteristics and also of the qualities of Khmer architecture figures the faculty of uniting with the taste for the picturesque that of order. All its compositions are rigorously centered and axial; their elements balaance; their outlines are inscribed within parallellograms tending to squares (266; 268; 269).

Effects of Ornamentation.

Yet the largest part was given to the effects of ornamentation.

By the evidence of the texts, we know that metallic overlays were much in favor; they consisted of plates of gilded copper, with which the domes especially were covered, and of gold leaves applied to the internal surfaces, almost always covered by a layer of vermilion.

The relief of Cambodian monuments was complicated by a profusion of ornaments and figures -- light embroideries, low or high reliefs, and even in the round. In a single edifice are
378 counted by hundreds the statues, by ten thousands the sq. ft. of reliefs, and figures by a dozen thousands. Decoration was inspired by nature, particularly by animal; by the views of life, and by religion. The floral repertory comprised flowers, rosettes, foliage, rich and varied scrolls (275; 276), t the entire fauna of the country was put under contribution, but the elephant was the preferred model. The part of the genre or the historical subject was considerable; hunting scenes, royal parades, religious ceremonies, demons and girls. Fanciful figures were multiplied; dwarfs and giants, serpents with seven heads (naga)(270), winged monsters (garuda), etc.

The execution was very unequal; quite careful or rough, according to the prominence of the motive; the best portions s show a singularly skilful chisel and a very refined eye.

Guided by a very lively feeling for the picturesque and a very assured taste in architectural requirements, Khmer art

frequently succeeded in impressing a monumental shape on orn-
aments, even combining a useful form and ornamental sculpture.
399 in the most ingenious and sometimes the happiest fashion. For
example, we cite great human and monstrous figures, carved on
a facade so that they appear to support the cornice on their
heads or their raised arms; fronts of elephants projecting f
from a wall as if their bodies were engaged in the mass to
receive the load of the upper courses; two serpents facing e
each other or outwards, that outline a pediment; a colossal
serpent borne by giants crouching or sitting on the edge of
a terrace or of a bridge, so as to form a parapet (270).

In brief, in spite of a tendency to excessively complicate form and to abuse ornamentation, Khmer architecture occupies an eminent place in the history of the art of building, for without speaking of the remarkable quality of its constructi-on, it has created magnificent groups, of grand and poetic ap-pearance, tasteful details, and some outlines of rare elegance.

Chapter 3. Javanese Architecture.

I. Requirements. -- Monumental Chronology and Topography. -- Conditions.

The ancient history of Java is entirely legendary. It places in the decline of the 1 st century A.D. the arreval in t the island of the first of a series of a stream of missionaries and of immigrants, who were to introduce there the faiths and the civilization of India. A tradition preserves the memory of the coming of natives of eastern Deccan and of the country of Kalinga, between the Godavery and Mahanaddi rivers; another mentions the establishment at the beginning of the 7 th century, of several thousands of men from Guzerat, otherwise termed the northwest of India. On the other hand, the C Chinese Fa-hian, who visited Java in 414, informs us that at that date, the island was devoted to Brahmanism, and containned but a small number of Buddhists. Finally there is the question of an active Buddhist propaganda in the 5 th century by missionaries from the country of the upper Indus.

It is certain that the eastern half of Java alone offers to architecture favorable human conditions, that there exist no monuments earlier than the 8 th century, and that none are later than the triumph of Mohammedanism in the island in 1479; that after the 13 th century a decadence occurred; finally, that the demand was at first especially Buddnist, and then after the 13 th century, almost exclusively Brahman.

The principal evidences for the architectural history of J Java are :-- for the 8 th century, the Buddhist Temple of Tjandi Kalasan and the Monastery of Tjandi Sari; for the 9 th, the great Buddhist Temple of Boro Boudour and the neighboring sanctuary termed Tjandi Mendoet; the group of Temples of Prambanam, also Buddhist -- on the site of the ancient capital -- notably with the Tjandi Seweu (end of the 11 th century); the Brahman sanctuaries of the plateau of Dieng (10 th to 12 th centuries), particularly the Tjandi Bhima; the Temples of the region of Melong (14 th century)-- Tjandi Jago, Tjandi Singasari, Temples of Panataran -- and those of Suku (about 1440). Note further the existence in the adjacent island of Bali, of monuments of the late epoch and of inferior quality.

Javanese architecture is derived from that of India. It ex-

exhibits the twofold influence of the art of Deccan (page 298) and of the Hellenizing formula established in the upper basin of the Indus (page 297). Yet it has given its own tone, entirely worthy of attention and of admiration in certain respects.

Recall that striking resemblances are observed between its productions and those of the Cham and Khmer schools. [3]

Note 3. See page 381; Figs. 266, 1,5; 278, 2 - 4; Note 2 on page 402.

401 II. Programmes and their Realizations.

402 Javanese architecture realized two sorts of religious programmes.

A first one comprised the erection of a sanctuary conformed to the Brahman style of India; a small square chapel preceded by a porch or with a projection on each side, or abain -- such as Tjandi Jabang -- circular with four rectangular projections toward the cardinal points; it was sometmies placed on the ground (279) -- as the case for the edifices of the plateau of Dieng,-- sometimes at the top of a series of terraces with ample flights of steps in front (278, I) -- like those of the region of Melong, -- sometimes on the top of a high p plinth furnished with a stairway on one of its sides -- such as Tjandi Jabang.

More original, the second formula composed a monumental group by the regular arrangement around a central monument of a number, sometimes very considerable, of entirely similar l little structures. [1] Two variants of this type are known, one illustrated by the Temple of Boro-Boudour (278, 4,5; 280), t the other by the Temples of Prambanam, notably by that named Tjandi Seweu (278, 2,3).

Note 1. Compare the realization of an analogous programme by Khmer architecture. Page 389.

At Boro-Boudour rises a high square terrace in five steps, [2] with a rectangular projection on each side; on the front of each step, interrupted by a stairway at the centre, commencing beneath a triumphal arch, is arranged a series of niches, 436 in total number; on the upper terrace rises a circular p platform in three receding stories, at the edge of which rise
403 dagobas (page 304) to the number of 72. A 73 rd one, designed

at a much larger scale, and which is the stupa or monument p proper, is erected at the centre of the uppermost circle.

Note 2. The terrace occupies a square 394 ft. on each side.

The second realization reduces the height of the substructure and the number of steps, replaces the dagoba by a cruciform sanctuary, and ranges around it in a square a series of entirely similar chapels, whose openings are either turned t-toward the central edifice or toward the exterior; the Tjandi Seweu exhibits 240 of these, arranged in 4 rows, each measuring 11.8 ft. on each side (278, 2).

The specimen of a Javanese monastery offered by the Tjandi Sari consists in three stories on a rectangular plan; each is divided into three chambers, the middle one being lighted by one window, the outer ones by two.

As for the house, the representations possessed by us prove, that it was composed of verandas in great measure, galleries and loggias. It was elevated on a substructure or on piles. The granaries are distinguished by the outward inclinations of their sides.

Note 2. See the reliefs of the Temple of Boro-Boudour.

Note 3. See Fig. 296, a Laotian realization of this kind of elevation.

III. Construction.

Javanese construction was of stone or of bricks and wood. In the first case it was set dry with care and regularly; it excluded the idea of the isolated support and erected arches and vaults with corbelled courses. In the second mode it raised columns and realized the covering by carpentry.

IV. Effect.

The arrangements just analyzed indicate a very lively taste and a very assured sense of the monumental effect of picturesque order. The substructures with broken profiles and sometimes very high, the multiplied stairways in stories, the projections of pedestals and of sanctuaries, the grouping of small shrines, combine energetically for the creation of piquant appearances full of movement (280). The impression is confirmed by the form of the crowning parts; it is indeed that of a lofty stepped form, sometimes ornamented by a niche for a statue at the middle of each side of the steps and bordered

at each angle by a reduction of its mass (279).[1] Finally, t the eye is interested by the perception of the accented and varied recessions of plinths and projecting cornices, pilasters, enclosures of openings and of niches, broken strings of stairways, crestings, pinnacles, dètailed and contrasted mouldings (279; 280; 281; 282).

Note 1. Compare the reliefs of the Cham temples, page 382.

Yet the Javanese style is likewise characterized by seeking qualities of harmonic order; by the love of rhythmic arrangements, regular and even symmetrical; by a marked care for disciplining accidental forms, and for ensuring some grand outlines and reliefs. Certain monuments, notably in the group on the plateau of Dieng, are distinguished by a freedom and a p purity of lines almost classical.

The ornamentation is very abundant, but is clearly subordinate to the architectural relief. It is composed of ornamental and of significant sculpture; on the one hand, the sacred images, religious themes, sacred legends, also genre and historical scenes (282); on the other being an abundant decoration by very flowery and complicated scrolls, lotuses arranged in bands, richly wrought pateras, monstrous and grimacing figures, sometimes realized at a great scale (281). The series of reliefs that decorate the Temple of Boro-Boudour would extend for nearly 3.1 miles, if placed end to end!

The execution is often remarkable and is sometimes excellent.

Chapter 4. Burmese Architecture.

I. Requirements. -- Monumental Chronology and Topography.

The population of Burma -- i.e., that of the lower basins of 429 the Irrawaddy and the Salouen and on the eastern coast of the gulf of Bengal is composed of Tibetans in the north and centre, of Indo-Chinese, analagous to the Khmers and termed Talains or Mons in the south; of Hindoos in the north and the extreme south.

The latter commenced to arrive in the decline of our pagan period (B.C.), and they came in great numbers in the first c centuries A.D. Some came from Gangetic India by land across Assam and established themselves in the north; the ruins of Tagoung on the Irrawaddy indicate their principla settlement. Others left Orissa by the sea route and founded flourishing colonies on the coast and at the mouths of the Irrawaddy and of the Salouen; the most important, Thaton on the lower Sitang, from before the beginning of the Christian era and for c centuries afterwards, was the emporium of the commerce between India and western Asia with the extreme East.

It was destroyed in the middle of the 11 th century by the Talain kingdom of Pegou, created about the 6 th century, and which with alternating progress and decadence remained prosperous and powerful until the middle of the 18 th century; its great centres were Prome and Pegou.

In the 7 th century was organized a properly Burmese state between the Indianized provinces of the north and the domain of the Talains in the south, whose capital Pagan covered more than 27 square miles, and was taken in 1284 by the Mongols of Khoubilai Khan. Its fortune was brilliant in the 14 th and 17 th centuries, when its kings reigned at Ava, built in 1364, and still more in the 18 th and the beginning of the 19 th, the epoch when the seat of government was a Amurapura, created in 1783.

Fervent adepts in Buddhism, that Hindoo missionaries brought to them from the 3 rd century B.C., the Burmese peoples manifested their faith by incessant demands for sacred monuments and monasteries.

At Thaton may still be seen pagodas older than the 11 th c century. Prome retains monuments of the 7 th, 8 th and 9 th

centuries (Temples of Baubaugyi, Payamaa and Lemyet-hna). At Pagan, more than 800 sanctuaries recall a great impulse in c construction, which was developed in the course of the 10 th, 11 th, 12 th and 13 th centuries. Temples of Pathothamaya (end of first third of 10 th century); of Ananda, Nagayon, Nam Paya and Choue Zigon, dating from the 11 th century; of Thatpynnyu, Gotapallin and Tsulamani, erected in the 12 th. We further mention the Choue Hmadou at Pegou; the Kyauktaugyi at A Amarapura (1847); Choue Gadon (15 th century, restored in 1768) at Rangoon; Temples of Myokaung, Akyab and Sandoway.

II. Conditions. -- Influences. -- Radiation.

Burmese monuments manifest the competition of several influences. First, that of India, resulting from the religious a and civilizing effect of that country, that especially introduced the artistic formula of Orissa (page 293); then that of the arts of Nepal and Tibet, explained by the geographical p position of Burma and the fact, that the greater part of its population was originally from upper Asia; further, that of Khmer and Chinese architecture, favored by the radiation of Cambodian civilization and by the political expansion of China; finally, that of "Greco-Buddhist" Asia, and more again, that of Mesopotamian-Persian Asia. (Pages 1, 297).

Yet the Burmese school perfectly assimilated what it borrowed, and it marked its productions with a very personal stamp, frequently very original and of the highest quality.

Its radiation very energetically influenced the development of a younger sister, Siamese architecture (page 414).

III. Programmes and their Realizations.

The Burmese palace was designed in the mode of the extreme East. In the interior of a rectangular enclosure by a moat filled with water between two walls, it comprised beyond the entrance a first court bordered by administrative buildings; a second in which was found the throne hall, indicated by a wooden spire with multiple roofs receding behind each other: a harem, and finally the o fices.

Burmese edifices bor religious purposes are of three kinds; monuments of the category of topes (zedi), temples and monasteries.

On a stepped terrace, generally square and sometimes polyg-

polygons, frequently accented in plan by projecting rectangular bastions, repeated several times, the first place being a mass with curved outline enclosing a small central cell; in
411 this mass are sometimes recessed four niches opposite the cardinal points, [1] and it is surmounted by a tall conical spire, crowned by an image of an umbrella in gilded iron. Reduced repetitions of the central dagoba frequently surround it, erected at the angles or placed along its entire perimeter; this sometimes permits a stairway at the middle of each step. (286, 1). [2]

Note 1. Compare the Nepalese formula for the same programme. Page 384.

Note 2. The Shoue Hmadou covers more than 21,500 sq. ft.; the first step is 9.8 ft. high and the second is 19.7 ft. T The upper termination extends to 348 ft.; 128 little dagobas may be counted.

The temple is sometimes a chapel on a square plan, preceded by a vestibule forming a porch; sometimes a sanctuary elevated on a square terrace, raised and much larger. [3] The latter has a projection on the front side or on all four sides (284; 286, 3); it is solid in the interior, or a peripheral corridor sep-
412 arates a nucleus, sometimes containing a deep niche on each side, intended to shelter an image of Buddha. [1]

Note 3. The Temple of Ananda at Pagan occupies a square m measuring 197 ft. on each side and attains to 180 ft. above the ground.

Note 1. compare the resemblance of this arrangement with that realized in numerous examples at the ruins of Idikutschri in eastern Turkestan (page 377).

In the category of buildings for monastic purposes, it is proper to mention the thein, as an example of which may be cited the Upali Thein at Pagan, a work of the 13 th century; like the Hindoo chaitya, it is a rectangular interior divided by two arcades into a middle and two side aisles.

IV. Construction.

Burmese construction has always utiliqed wood for domestic buildings and almost exclusively bricks for relegious edificces.

In the number of its most characteristic traits, figures t the use of the radial arch and tunnel or half tunnel vaults, built in slices in the mode of Mesopotamia (287), [2] and excep-

exceptional in the south and southeast of Asia.

Note 2. Recall that the procedure was common in eastern T Turkestan (page 377), and that a portion of the Burmese people were originally from upper Asia.

V. Effect.

In Burma, the conception of the effect was more monumental than in India, for it subordinated the details of secondary relief to some grand effects of outline and mass.

A more slender shape restricts the analogy presented by Burmese edifices to those of India. Thus that the tope tends to be ovoid and sometimes bell-shaped, often with interruptions of the profile at about two-thirds its height by the projection of an annular band; the aspiring appearance is again accented by a tall pinnacle drawn out at the top. Likewise for the temple, whose truncated pyramid is crowned by a slender sikhara with concave outline (284; 286).

Various peculiarities imply a taste for picturesque relief; the projection of bastions repeated several times on the facades of the substructure; a cruciform arrangement of the sanctuary; a row of diminutives of itself around the monument; f for the covering of buildings for habitation, roofs in the N Nepalese or Chinese fashion; monumental portals, which recall those of our cathedrals (284); pronounced bosses; walls crowned by battlements; raising the edges of roofs by sharp and profiled acroteries, and foiled shapes of arches (286, 3) etc.

Ye. the Burmese school also had a passion for ornamentation as much as any of its rivals in the extreme East. Its elevations in bricks were masked by coverings of cement or stucco, or by the attachment of panels of terra cotta or faience; it covered carpentry and woodwork with lacker; it lavished gilding; it multiplied frescos and ornamental sculptures; bands, friezes, festoons, pendants, garlands attached to monsters and grimacing masks (268).

414 Chapter 5. Siamese and laotian Architecture.

I. Siamese Architecture.

Monumental Chronology and Topography. -- Influences.

The history of Siamese architecture commences in the decline of the 13 th century with the foundation of Sokothai (Sukhoda), capital of the kingdom, that a portion of the Thai people, originally from S.-tchouen or from eastern Tibet, began to establish in the 10 th century in the upper basin of the Menam, and which was developed at the expense of the Khmer empire. The young city rapidly increased, and until the middle of the 14 th century, the time at which it was abandoned, it was filled with palaces and Buddhist sanctuaries, among which may be distinguished one, named Vat Jai. A little to the south of Sokothai may be seen imposing vestiges of another city of the same epoch, Sajjanalaya. To Sokothai succeeded Ayouthia, that the Burmese destroyed in the middle of the 18 th century; European travelers have vied with each other in celebrating the monumental splendor of the second, still attested by ruins invaded by the jungle. On the other hand, important temples arose at Laphabouri, and after the end of the 18 th century at Bangkok, the present capital.

Siamese architecture borrowed from its older Khmer and Burmese relatives. It also felt the influence of northern India, of Nepal and of China.

Programmes and their Realizations.

The plan of the Siamese palace, such as described by the v visitors to Ayouthia in the 17 th century, [1] recalls that of the residences of the Khmer kings. In the interior of a double enclosure succeed each other beyond the entrance; courts devoted to storehouses, offices, and the lodgings of officials; a royal residence on a cruciform plan and crowned by a high pyramid in stories; lastly, the women's residence. The gardens are divided into compartments defined by rows of bricks set on edge and separated by narrow walks; they are planted with trees and flowers and are cooled by basins and running water.

Note 1. See the reports of Gervaise and of La Loubere.

The religious architecture of Siam has applied two formulas, one imported from Cambodia -- which we shall neglect (page 3

389), and another peculiar to Siam, and whose analysis is as follows (290). A rectangular enclosure (Kampheng keo) with facade toward the east is crowded by various edifices. First opposite the entrance, one or more sanctuaries (bot) are reserved to the priests for ordinations and assemblies; the bot is an oblong rectangular building, accessible on the eastern side, preceded by a porch (na-muk) and divided by rows of columns into a middle and two or more side aisles; in the walls of the latter are opende windows, whose function is completed by clearstory windows arranged in the sides of the middle aisle over the roofs of the side aisles; at the rear, a great altar (phra-sok) bears a statue of Buddha (290, 2; 292). There are also the phra-chedi, dagobas or reliquaries of the canonical type but very slender, on a circular plinth and with outlines in bell form, surmounted by a square block and crowned by an annelated spire ending in a sharp point (291); the phra-prang, very small chapels crowned by the trident of Siva, placed on a high pedesta, and accessible by a narrow and steep stairway (291); shrines with statues of Buddha or with imprints of his feet, some sjuare (mondob), the others cruciform (chatta-muk), conceived to shelter Brahma with four faces, a and later four images of Buddha; temples (kamburien); halls for prayer (vihan); sacred libraries (ho'trai); shelters for pilgrims (sala); monastic lodgings (ka-ti), campaniles (ho' rakhang), sacred basins (sa). The group beass the name of Vat.

Construction.

In Siam, according to the custom of the extreme East, secular architecture substantially employs wood and bricks, the latter of mediocre quality. Religious construction is skilful in stone masonry, in dressed sandstone for the careful parts and for those to be sculptured; in limonite for the remainder. Of stone are fashioned the isolated supports in buildings with several aisles, their caps bear a roof in carpentry, covered by glazed tiles, while in Chinese fashion, mortises cut in their shafts receive the ends of beamr and the rafters of the covering of the side aisles (292). Terra cotta is much appreciated for constructing balusters set in the openings of windows, and there is great use made of lime mortar for c casting in moulds sculptures for placing on the masonry.

Effect.

Siamese architecture manifests its love for picturesque effects by a mode of crowning religious edifices by sharp spires or by tall cylinders with ovoid terminations, analagous to the Sikhara of Orissa (page 321)(291), and the covering of s secular structures by high roofs in stories, after the Chinese fashion, with crockets at the angles, but without a concave curvature of the ridge.

Its passion for the effect of ornamentation is shown by an extravagant profusion of sculptures, facings of faience and glass beads, paintings, silvering and gilding.

II. Laotian Architecture.

Monumental Chronology and Topography.

While the Siamese Tais established themselves in the valley of the Menam, the Laotian Tais installed themselves in the m middle part of that of the Mekong. About the 13 th century was established a powerful kingdom termed Lan-Xang, with Vieng-Chan as capital; it extended from about 20° north latitude to the rapids of Khong. In the 17 th century, it was so flourishing, that it passed for one of the richest countries of the extreme East. [1] Weakened at the beginning of the 18 th century, it could not resist the repeated attacks of the Siamese, who completed its subjugation in 1826. On several occasions, portions of Lan-Xang became independent principalities; such was the province of Luang-Prabang, which prospered about the middle of the 14 th century and till the beginning of the 18 th, also those of Xieng-Mai, of Bassac, [2] etc.

Note 1. See the journey made by G. van Wusthoff in 16115 on the account of the Company of the Indies, to the kingdom of "Loumen" (Lan-Xang).

Note 2. For the monumental topography of Laos, see Fig. 289..

Of the architectural production of the Laotian Thais, there remain numerous evidences at Vieng-Cham, which in 1644 counted 25 temples, among which were the Vat-Phra-keo, the shelter of the "Emerald Buddha", one of the most celebrated images of Sakya-Mouni; [3] at Say-fong, where have been recognized 27 sanctuaries; at Luang-Prabang, Xien-Sien, Xien-Khang, Xien-Wai etc.

Note 3. The statue was brought by the Siamese to Bangkok, where it is honored in the pagoda of the Royal Palace.

Laotian architecture appears nearly related to the modern Siamese; indeed, according to the natives, the Siamese imported by force Laotian artists to the banks of the Menam. It is certain that the Laos, like Siam, was influenced by Khmer.[4]

Note 4. Note the legend that attributes the foundation of Say Fong to a hero from the south.

Programmes and their Realizations.

The Laotian temple groups a sanctuary, memorial monuments or reliquaries (that), chapels, a campanile, sacred libraries and lodgings for the priests.

The plan of the sanctuary presents a curious analogy to that of the Grecian temple (293; 294). On a substructure more or less elevated, sometimes profiled in steps, with front and rear stairways, rises a rectangular interior, accessible by a principal doorway opened at the middle of one end, and by two small ones, either pierced at the sides of the former, or at the ends of the side walls. Lighted by windows at mid-height, it contained at the rear a great altar, supporting a statue of Buddha and preceded by a pulpit; sometimes two rows of columns separate a middle and two side aisles. Before each end is a double portico, and when the hall is undivided, lateral colonnades form a peristyle, whose intercolumniations are partly closed by perforated parapets or by balustrades. The sanctuary is frequently at the centre of a paved court, bordered by a portico, whose rear wall contains niches to shelter Buddhas.

Note 1. (294). The original drawing is the work of Delaporte.

The that is a dagoba analagous to the Siamese Phra-chedi ((291); it forms a monumental realization in the shape of a h high terrace in two stories, supporting on the upper platform a great dagoba surrounded by several smaller ones.[2]

Note 2. At the That-Luong of Vieng-Chan are counted 26 small dagobas.

The small structures for use as libraries are little square or rectangular cells, lighted by windows and raised on plinths.

Construction.

Bricks and wood were the ordinary materials for Laotian con-

construction; it employed stone but rarely, for substructures and isolated supports. It made much use of coatings of stucco. Hostile to verticals, it adopted only battering walls, or overhanging ones in the case of a library (296); trapezoidal o openings; piers with sections diminishing from base to top.

The covering was realized by a wooden ceiling. The roof w was high and projected very much, and when it covered a temple, it was divided in tow parts, one corresponding to the interior, and the other to the front and rear porticos, and according to the case, also to the side aisles or colonnades; the former had two slopes, the latter being sometimes a shed roof, sometimes similar to and symmetrical with that of the nave, the gables being closed by screens of carved wood (294; 295).

Effect.

The relief of Laotian edifices was very picturesque. It comprised effects of secondary reliefs and of details result-
421 ing from moulding the substructures; from an enclosure of the doorways by recurved architraves, and of the windows by the aid of pilasters, with a stepped triangular pediment; from t the form of the capitals in the image of two superposed series of lanceolate leaves, the upper row ascending and the lower leaves being recurved, enclosing the cap of the pier (294); from a construction of the ceiling in coffers, and from the projecting horns at the extremities of the ridge and angles of the roof (294; 296).

Rich to excess, the ornamentation comprises stuccos, paintings in a dominant red, facings of faience and glass beads, with gilding in abundanee. The decoration consists in a profusion of slender ornaments,-- arabesques of leaves and flowers, small religious or fantastic figures, -- which detach t the contrast of their gilding from the dark red of the background (294; 296). The original of 296 is by Delaporte.

22 Section III. Japanese Architecture.

I. Requirements. -- Monumental Chronology and Topography. ..The assured history of Japanese architecture does not precede the beginning of the 7 th century A.D., and its development ended in the 17 th.

Its advancement, which reached a climax, in the 17 th century, was favored by abundant religious and secular demands, r resulting on the one hand from the competing advances of the two religions of Shinto and Buddhism, the first being a client of the art of building from the Christian era, the second having been imported from Corea at the middle of the 6 th century -- and on the other, to the need for the palaces and fortresses of powerful sovereigns and princes, interested in building, several of which possessed a feeling for the art a and taste for construction.

23 In the primitive epoch (1 st and 2 nd centuries A.D.), tradition gives honor to the most famous temples of the Shito f faith; those of Assouta and in the province of Ise, those near Yamada (Temple of Geku) and Toba (Temple of Naiku).

In the 7 th and 8 th centuries Nara, -- capital of the empire from 708 to 782 -- was a great workshop of religious building, whose memory is perpetuated by the Buddhist Monasteries of Horiouji (beginning of the 7 th century), of Todaiji (second quarter of the 8 th century), of Yakushiji (middle of 8 th century), and of Kouanon (end of 8 th century). To the
24 7 th century belongs the great Shinto Monastery consecrated to the god Onamuji, at Itzumo near Kizuki.

The demand appears to have been greater still in the 9 th century, increased by the transfer of the seat of the empire to Kioto in 782. It is recalled by the Temples of Kassouga at Nara; of Hatshiman at Kioto, of Obakou at Ouji, and by the Imperial Palace of Gosho at Kioto, etc. From the 11 th century dates the construction of the Temple of the Phoenix at O Ouiji, and of the Shinto Monastery of Ishiyama (1078), rebuilt a century later, and again about the end of the 16 th century. The 13 th century -- the time of the erection of the Temple of Tokoufoudji -- and the 14 th were an epoch of military life, rude and severe manners, excluding luxurious and artistic tastes. But in the 15 th and 16 th centuries, under

the dynasty of Ashikaya, architecture prospered in its religious, secular and military forms:-- Palace of Kinkakoudji (beginning of the 15 th century) and that of Ghinkakoudji (middle of 15 th century) at Kioto; Palace of Himkakou, Buddhist Temple of Nishi Hongouandji (1591) at Kioto, and Citadel of Osaka (1582).

225 After a disturbed period (1580-1601), the 17 th century was an epoch of brilliant civilization and of incessant demands, notably under the reign of Yemitsou (1623-1652), an artistic and building prince, who ecployed the famous architect-sculptor Hidari Zingoro:-- we cite the Castle of Yeddo (Tokio), b built at the beginning of the century by Yeyasu, the first of the Tokugawa Shoguns; the funerary Temple of this prince, erected by Yemitsou at Nikko; the Temple of Tshioin at Kioto; those of Assaksa, Shiba and Ouiyeno at Yeddo (Tokio), the two last now ruined; the great Pagodas of Kioto and Osaka; the C gastle of Nagoya, etc.

II. Natural and Human Conditions. -- Influences. -- Epochs.

Japanese architecture is both favored and injured by nature; on the one hand, this is lavish with stone materials and the finest trees in the world, a species of conifers, that raise a straight and rigid trunk to a height of more than 98 ft.; 226 on the other, it refuses to it stability of the ground, earthquakes being in Japan as formidable as frequent.

The climate is characterized by the shortness of winter and by the occurrence of heavy and continuous rains in Bune and July.

Architecture has not obtained from the Japanese an attention equal to that accorded by them to the arts of design and decoration. Their efforts never tended to the invention of n new programmes or to the solution of the problems of construction; they were attached only to perfection of the execution and to the beauty of the ornamentation.

Japan imported from China with Corea as intermediary, nearly all the elements of its architecture, those of the construction as well as those of the plan. For a long time, it was even tributary to Chinese industry for the glazed tiles of i its roofs. [1] But under the influence of special natural condi-

conditions, the peculiarities of temperament and of civilization, as well as of a superior artistic genius, the Japanese
42 derived from their borrowings a method and effects, which differentiate their productions from their models, generally to their advantage.

Note 1. Until the end of the 16 th century, the time at w which the Coreans introduced into Japan the manufacture of t these tiles.

Their system of construction on piles appears to be an assured indication of Indonesian influences.

Finally, one should not be surprised that a Buddhist architecture may have been impressed by the art of India.

There can scarcely be any question of evolution in regard to Japanese architecture. The distinction between epochs is based on the following observations.

Before the 7 th century A.D., a primitive art produced works with Indonesian affiliations. From the 7 th to the 11 th centuries, it developed in a dependence on China. In the 11 th and still more in the 12 th, it made its advance and attempted innovations. In the 15 th century, it exhibited a fixed system for arrangement as well as decoration, and was master of the processes. In the 16 th century, it inaugurated a passionate seeking for effect in an ultra picturesque key, which in the 16 th century again increased and became excessive. After the 17 th century, it repeated itself.

III. Programmes and their Realizations.

The programme of a Japanese dwelling is extremely simple, but very appropriate to the structural conditions. It essentially foresaw a structure, composed of a roof set on four p posts, to which a floor is attached at about 0.8 ft. above t the ground. The intervals are closed by wooden panels, or by frames covered with paper; both are movable, so that in the daytime and in calm weather, ventilation might be the greatest possible (300; 301).

Light and movable partitions, about 6.6 ft. in height, divide the interior into several cells and a living room, at the rear of which is arranged a recess (tokonoma) adorned by some
43 kakemonos, a vase of flowers and a small table, on which are ornamental articles. Communications are provided by a veranda

and a gallery, which frequently forms a balcony attached to the posts of the carpentry and sheltered by the projection of the roof (300; 301).

As proper in a country exposed to seismic shocks, it is rare for the elevation to comprise several stories. The residence is extended on the ground by the construction of separate small houses, connected by covered passages, and repeated as often as necessary.

Indeed the Japanese do not conceive a house without a garden.[1]

Note 1. Concerning the Japanese garden, see page 435.

There is scarcely more pretentiousness in the arrangement of a palace, a simple group of pavilions, scattered in a garden, with communications by means of galleries.

429 430 The composition of an imperial palace is distinguished in proceeding from the exterior by an entrance between the guard houses, an internal court bordered by offices, a building for governmental ceremonies, and a private residence.

Of all the schools of the extreme East, the Japanese is the only one, that has elaborated scientific fortifications; in fact, it applied the principle of flanking, combining the system outlined in zigzags and that of towers. The Castle of T Tokio was built by Yegam at the beginning of the 17 th century, and is a remarkable specimen of military architecture. (302).[1]

Note 1. Japanese fortification dates from the decline of the 16 th century; its elaboration was determined and conditioned by the knowledge of western arms, which the Portuguese carried to Japan.

Religious Programmes.

The Japanese formula of the Buddhist temple accents the dispersed character of the Chinese religious programme; in truth, it is a verdant and flowery park, according to the relief, s strown with sanctuaries, monuments and various dependencies. (303, 304). The area is surrounded by a wall and is divided by fences into several areas, generally more and more elevated. They are accessible by triumphal gates, frequently with two stories, at the top of flights of steps, to which lead avenues of trees (298).

On a base, raised 3.8 to 6.6 ft., is built the sanctuary (

(hondo), the receptacle of a statue of Buddha; it is sometimes divided in three successive halls for different purposes, the first being an oratory, the second an inner vestibule, and t the last is the holy of holies. Here and there rise reliquaries recalling the Indian tope (page 303); a small structure
481 to shelter vowed gifts; pagodas in stories on square plans, surmounted by a pole serving as the axis for nine metal rings (page 303); [1] low campaniles; pavilions covering gongs or basins; great lanterns of bronze; libraries; cloisters; lodgings for the priests etc.

Like that just analyzed, the Shinto variant of the religious programme contemplates the choice of a picturesque and wooded site, the enclosure of a sacred area, the separation of numerous structures and small buildings (305). But it differs in
482 several peculiarities. Before the first entrance, instead of a gate of honor rises a portico (tori)-- in wood or in stone and metal -- on the model of the Indian toran (page 302), composed of two posts with a cross beam raised on the two ends. (299). The composition is more regular than that of the Buddhist temples, more like the conception of Chinese architects; axial and symmetrical, it has several successive concentric square terraces, bordered by galleries enclosing the court. The highest supports the temple (honsha); it is divided in t two parts; a front and accessible one, and a sanctuary, in which is preserved a bronxe mirror, an image of the sun, a sword and the Magatama.

IV. Construction.

The Japanese have never been embarrassed by the construction of masonry of polygonal or rectangular stones; witness certain substructures of buildings and many retaining walls or fortifications, whose surfaces indicate a desire to increase the ability of resistance to earthquakes (302; 306).

In this scourge of Japan must bee seen the primary cause of
483 the decided preference of Nippon architecture for a construction entirely in wood; a second cause consists in the extraordinary abundance of trees. It is entirely proper if the hard materials are employed for the foundations and the substructure.

The latter is very low (300), almost always divided into as

many small independent masses as the carpentry structure contains posts. On the whole, the Japanese build on piles.

Japanese carpentry was always singularly skilful, and certain of its practices are very ingenious; such as the construction of a pagoda tower by means of a great mast serving as an axis to a framework (309); such again is the happy method, t that the Japanese derived from the system of successive corbelled brackets, which we mentioned in the preceding Chapter. (308). But no more than the older Chinese were they ever arranged with the triangular panels and the truss with tie-beam. (307).

What we have said of the construction of the Chinese coverings and roofs is true for the similar Japanese, realized under the influence of China (298; 304; 313) and in competition with a native system of roofing without upward curves (300; 301). We limit ourselves to noting, that being compelled to take account of the instability of their soil, the Nippon builders reduced the weight of the covering, either by lessening the thickness of the tiles, or by replacing them by lapped s sheets of copper, single or doubled, even by sheets of bark detached from the hinoki tree (300, 301).

V. Effect.

As careful for effect as its Chinese rival, Japanese archi-
434 tecture long sought it with more discretion and taste, particularly when in the service of the Shinto religion; however in the 17 th century, it sacrificed this to luxury, even to excess.

In the number of its essential characteristics is counted a passion and a sense of the picturesque, for example, which attests the good fortune, with which it always sought an emphasizing of its monumental productions by an adroit placing on a stage of select nature.

On the whole, the forms of Japanese buildings repeat those of the Chinese with differences in details; for example, such as those resulting from the projection of a porch above a flight of steps, and the construction at the middle of the lower edge of the slope of the roof, of a wavy gable, convex at top and recurved at the two ends (298). The school of the 1 17 th century abused the movement of line and relief, even c creating a pretentious and heavy appearance.

Nippon architecture derived excellent effects in decoration from the perfection of the work of its carpenters and the admirable quality of its varnish, lacker, bronze, and native g gilding, from a rich polychromy, where vermilion dominates and in which compete reddish brown, violet, green, yellow and gray; metallic overlays and facings; incrustations of mother-of-pearl; finally, a luxuriant painted and sculptured ornamentation, whose execution is almost always of rare quality, and whose dominant themes are the figure of the Chinese dragon, images of flowers and birds, with some geometrical motives ((298; 312). Besides, the interiors are enlivened by pictures painted on paper and fixed in the panels filling the carpentry frame.

Endowed in the heghest degree with feeling for nature, the Japanese were always as attentive to the composition of the garden as to the arrangement and decoration of the dwelling or the temple.

First, after the example of the Chinese (page 354), they l limited themselves to the creation of miniatures of landscapes dominated by the effect of water, requirec from ponds, basins and winding streams. Rare plants; dwarf trees and shrubs with singular shapes; bridges, grottos, pavilions, little temples, lanterns in stone or bronze completed the view. Sometimes was realized in miniature the image of a celebrated locality (313).

After the 13 th century was developed a type, whose formula was fixed in the second half of the 15 th century and was applied on a great scale in the 17 th. A result of that precious subtlety from which otherwise proceeds the Japanese tea ceremonial, it was conceived less for the welfare of the body and the pleasure of the eyes, than with the aim of exciting feelings and thoughts. The general outline, the choice, the arrangement and height of the plants; the adoption and placing of architectural and decorative motives are regulated by a s symbolism, which attaches to each objector mode of presentation an exact sense, recalling a being, a fact or a quality.

437 Book VI. Indigenous Architectural Styles of America, Oceanica and Africa.

Part I. Architecture of precolumbian America.

Section I. Architecture of Mexico and Central America.

The civilizations, that flourished in Mexico and central A-America at the time of the conquest of those countries by the Spaniards (1519-1521), were elaborated by those peoples on t the red race; that of the Mayas in Yucatan, in the western part of the isthmus of Tehuantepec, known under the name of the Chiapas country, in Guatemala and in the west part of Honduras, that of the Zapotecs and of the Mistees in the eastern region of the isthmus of Tehuantepec, in the vicinity of Oajaca; finally that of the Nahuatl (aztecs), who dwelt in the basin of Mexico.

I. Requirements. -- Monumental Chronology and Topography.

The energetic race of the Mayas successfully practised agriculture and commerce; their princes were rich,and their pri-
438 ests were powerful. The number and importance of the ruins, with which the country is still sprinkled, attest that the causes of the architectural demand were efficient.

The principal evidences are :-- in the north of Yucatan, the monuments of Uxmal ("Palace of the Governor", "House of the Nuns", "Temple of the Magician"), of Izamal and Chicnen-Itzu, -- these being numerous and varied, those of the island of Cozumel, of Zayi etc.; in the isthmus of Tehuantepec, those of Palenque -- which are of the highest interest; in Honduras, those of Copan; in Guatemala, those of Yaxchilan etc.

The architectural works of the Zapotecs, whose quality is remarkable, are known by the vestiges of a city with temples and palace on Mt. Albon, west of Oajaca, and by the original and relatively well preserved edifices of Mitla, east of the same city.

As for the works of the Nahuatl, they are recalled by the remains of a city at Tollan, north of Mexico; by two great t temples at San Juan de Teotihuanacan, 25 miles northwest of Mexico; by the vestiges on the southeast shore of Lake Tezcuco, of Tenochtitlan, the capital of the Aztec kingdom, destroyed

by the Spaniards. Again note the ruins of Huexolla near Tezcuco, Cholula near Puebla, of Xochicalco south of Cuernavaca etc.

439 The products consist of private or princely habitations; temples and tombs. The purpose of many of these monuments is obscure. There are no traces of fortifications.

The chronology of these architectural styles is indeterminable. It is certain that their youth only preceded by some centuries the arrival of Fernando Cortez, and that they were in full grouth, when their career was brutally interrupted by the Spanish conquest.

II. Natural and Human Conditions. -- Influences. -- Schools.

In Yucatan abounds stratified limestone, easily cut, and in large measure entirely quarried by reason of fractures, resulting from the work of water and of plants. The climate is very damp and very hot. The first of these characteristics is even more marked in the region of Palenque, where the rock is likewise limestone, but very hard.

A similar sky, though a little less rainy, extends over the country of the Zapotecs. Toward Oajaca, the ground contains a quartz difficult to work; but in the vicinity of Mitla is found a relatively soft trachyte and also clay, suitable for clay concrete and for making bricks.

From the climatic point of view, the Mexican plateau is more temperate than the provinces previously mentioned. The builder there practically has at command lava and clay.

Note the extreme forest wealth of Central America.

At the time they were crushed by the conquerors, the peoples of Mexican and Central America had attained a relatively high level of civilization, nearly that of Egypt in the time of the first dynasties. They possessed a mode of writing, a annals, and remarkable calendars, they practised successfully the ceramic and textile arts.

Amply provided with labor, thanks to a regime of theocratic absolutism, the architectural styles of Mexico and Central America were injured by the insufficiency of their technical r resources; in fact, they had only rudimentary tools of stone,
440 which in truth, their workmen employed with singular skill.

Their origin and evolution are unknown. Were they aborigines? Did they proceed from the arts of eastern Asia, either that a migration of Asian peoples passed into America across Behring's strait of by the Aleutian islands, or were there direct communications by sea? The second hypothesis, which m may be subbested by certain analogies in appearance between the monuments of Central America and those of Asia; the resemblance of some American beliefs to those of the people of Oceanica; finally, the mention in Indian legends of the civilizing work of a hero, who came from the West, has nothing improbable, considering the direction and regularity of the aerial and marine currents between Asia and America. It is more difficult to admit the supposition, that the artistic development of Central America might have been influenced by an importation of Asian elements, resulting from the extension of the Northmen to the New World.

The analysis of the ruins reveals the coexistence of three schools in Mexico and Central America; the Maya, the Zapotec,
441 and the Nahuatl; the two first being equal and the third inferior. Each comprised a subdivision; the art of Palenque differs from that of Mitla, and that of Teotihuacan from that of Tenochtitlan.

III. Programmes and their Realizations.

Domestic Programmes.

The architectural styles of Mexico and Central America were applied and succeeded in protecting the dwelling, both from the excess of tropical sunshine and from the dampness of a s soil soaked with violent and prolonged rains. They had no o openings other than doorways, which were sometimes sheltered by a vestibule (316, 5), and they were elevated on a high terrace (318, 7,8).

Although they utilized the expedient of columns, as a gene-
442 ral rule they subordinated the outline to the necessities of the covering, obtaining the required area by developing the plan in length, which forms one of their characteristics. (316, 5,7).

The habitation was generally composed of four independent structures arranged around a square court, which was consequently open at the angles (316, 5). Indeed the doorway with leaves was unknown; openings were closed by the aid of porti-

portieres or mats, suspended by cords, for the tension of which there were ingenious arrangements on the surfaces and at the angles of the walls (318).

In the region of Mitla is observed an evolution, which first determined a connected arrangement of the buildings, producing an enclosed court and an entrance, properly so called; then the conception of a homogeneous edifice divided into four apartments, with a vestibule and sometimes a vast porch,
443 extending the entire depth of the facade or even exceeding this (316, 1-3).

Among the Mayas, the system of independent buildings just mentioned, with facades on a court, was in competition with another, where a row of small cells abutted against a rectangular mass, and which comprised an elevation in stories, receding behind each other (316, 7).

The modest tombs consisted of small vaulted chambers. Doubtless it is necessary to behold funerary monuments in sever- edifices, which pass for temples.

Religious Programmes.

In Mexico and Central America, the temple consisted of a high platform, on the top of which were performed the sacrifices, and which was surmounted by a chapel. The substructure was either formed by a rectangular terrace, by the frustum of a pyramid, with its surfaces smooth or cut in steps, or by a series of terraces receding behind each other (317, 9-14). In Central America, the dimensions never exceeded 495 ft. for the side of the base and 98 ft. for the height; in Mexico, t the great Pyramid of Teotihuacan covered nearly 537,000 sq. ft. and now extends to 176 ft. above the ground.

The sanctuary sometimes consisted of a single cell, entered by one or more doorways, sometimes of a chamber preceded by a vestibule, or sometimes of a row of cells, which extended behind a porch, the middle one containing a holy of holies; (317, 1-8); this was reached by a wide central stairway, or sometimes by four, one on each front (317, 9-14).

IV. Construction.

Materials.

The stone monuments of Yucatan exhibit decorative motives, whose forms preserve the memory of a primitiwe construction

entirely of wood, and a notable part of that material entered into their construction in the form of isolated supports, lintels, architraves, and of closing panels.

In the Zapotec country and on the Mexican plateau, domestic construction and even monumental largely used earth; at Mitla being mixed with straw and stone spalls; at Mexico with straw or fragments of lava (adobe). These served in the form of c clay concrete or of bricks, which were connected by clay mortar.

Still the use of stone materials was current. Narrowly restricted by insufficient tools, the American styles of architecture had to accommodate themselves to forms, that the texture of the rocks imparted to masses detached from them by fracture, according to whether they had to do with stratified stone or not, they employed rectangular or polygonal masonry, and according to the degree of the hardness of the material, and doubtless also according to the importance of the programme, they resigned themselves to irregularities, or required the leveling or even regularity of the courses, just as they sought vertical joints or not.

In Yucatan, where appeared a soft limestone in natural layers, they freely quarried great blocks [1] and practised perfect cutting, whose merit is measured by the fact, that a certain facade with a mosaic and incrusted surface comprises more than 20,000 blocks of different shapes, joined by mortise and tenon and accurately fitted (315).

Note 1. Without ever exceeding a weight of 7.7 to 8.8 tons.

At Mitla was freely employed the local quartz in great masses weighing as much as 16.5 tons, and the material was prepared with the greatest care. On the Mexican plateau were used lava blocks of irregular sizes and shapes.

The builders in Central America made an enormous use of an excellent mortar containing lime, sand, pebbles and broken stone. They also prepared a waterproof cement of the first quality. Finally, they made great use of stuccos of very remarkable quality.

The Methods.

The Maya school of Palenque practised a solid, but rough c construction, filled with mortar; they also concealed it by stucco.

On the contrary, the Mayas of Yucatan, and still more the Zapotecs, sought for beauty of the masonry (315; 320).

Among the former, the economical expedient of a mixed construction of concrete between careful facings was the rule. The terraces were constructed of a nucleus of stone spalls connected by clay or mortar, enclosed by a facing of dressed masonry and a platform in cement. The walls, whose foundations e extend to the ground through the substructure, were composed of a filling of small materials joined by mortar and of two faces of beautiful stone masonry. The elements of these were merely jointed on the exterior, but were strongly reduced toward the interior to ensure filling with mortar, which should cause their cohesion (319, 7,8).

The Zapotecs likewise made the middle of their substructure of small stones and clay, or even of crude bricks. But their masonry was homogeneous. On the facade the blocks were jointed as well as possible, the cement only being interposed to correct the defects of imperfect cutting; but the tails were cemented as in the Maya syrtem (320).

In the entire extent of the Mexican and Central American, the construction was extremely massive, doubtless with the a aims of ensuring the edifices against earthquakes and of protecting the interiors from solar heat. At Mitla, the average thickness of the walls is 3.95 ft.; in Yucatan it varies from 3.3 to 9.7 ft.(319, 6,7,8).

Except in Mexico, where they were slightly battering, the external surfaces were vertical.

The openings were covered by lintels of wood or of stone s set on vertical jambs (315; 320; 321), or as the current practice in Yucatan, by an arch produced by corbelling the courses of the wall (319, 4).

The isolated support, which was very much employed, very f frequently consisted of a wooden log. In stone at Mitla, it was monolithic, everywhere else being built; otherwise massive, often being a portion of the wall, rather than a pillar. (320, 321).

Ordinarily, the floor was made of a layer of cement 3/4 to 2 ins. thick and surprisingly hard; more rarely, it was of stone slabs.

447 Among the Zapotecs and the Nahuatl, the covering was a ceiling of wood or of stone, which was supported by columns if n necessary (319, 6). The Mayas preferred the vault, that they realized in the form of Angular tunnel vaults erected by corbelling the courses and closed by slabs (319, 7,8).

Excepting at Palenque, where to facilitate the discharge of the very abundant rains, they gave it a slope (319, 7), the roof was a terrace (315; 319, 6,8; 320).

V. Effect.

The architectural styles of Mexico and Central America passionately sought for effect by all means at the command of t the art of building.

They had the taste, and in large measure the sense of the picturesque arrangement of monumental form. That came from their method of elevating sanctuaries on pedestals, furnished with grand stairways (317), from arranging buildings for a palace in stories on the steps of a terrace (316, 7), or from placing them on platforms dominating a great court and modeling them in steps on their front surfaces (316, 5). As typical examples of exteriors may be cited the ruins of Palenque with their great terraces, arranged in stories from the banks of a river to the platforms supporting the temples; and also these of Mt. Alban near Oajaca, which recommends the great o operation of grading an entire canton, with the aim of composing a theatrical and magnificent group of islands, promontories and of hills crowned by edifices. Characteristic likewise are the great double or triple openings (320; 321) and the high crestings with which the Mayas finished the roofs (319, 6,8).

The secondary reliefs of the monuments of Central America are more developed, than one would expect from architectural styles without tools of iron.

Thus the facades were limited at top by the projection of the cornices (315; 319, 8), which sometimes projected very f far in the region of Palenque (319, 7). The walls were accented by embryo mouldings; cut according to the economical profile of a tablet with vertical or beveled edge, sometimes following the outline of a half square separated by two right-a angled triangles with their most acute vertexes opposed, the

mouldings were often repeated above and below a field forming a band (315; 319, 6,7,8; 321).

Movement was again produced by sinkings or perforations ((320); as also by the relief of half columns, cylindrical or turned like balusters, frequently set close after the fashion of the posts of a palisade (321, 4). Add a very original effect of projections, resulting from the mode taken by the architects of Central America to project from the face plane t the surfaces and edges of the angles of bosses in form of blocks or of rising or falling crockets, which one might say w were carved in wood (321, 4).

The effect of reliefs of details was only neglected.

The ordinary form of the isolated support was that of a rectangular prism or of a cylinder, both very stumpy (329, 6; 3 321, 4). At Mitla, it was a sort of cube, whose front face was quite battering, and above was enhanced by a rectangular tablet enclosing a niche (320);321, 3). In Yucatan, fanciful forms were loved; for example, that of a kneeling man with back against a post, and particularly the singularly decorative one of a serpent, the head at bottom and resting on the ground (321, 2).

419 Likewise in the image of that reptile, extending from top to bottom, were fashioned the parapets of the stairways leading to the terraces.

The architectural styles of Mexico and Central America freely sacrificed to ornamentation.

Among the Mayas of the region of Palenque and among the Nahuatl, a coating of stucco was the rule. The former applied it over the entire internal and external surfaces of the edifice, including the roof.

All the schools lavished sculptures, which were sometimes confined to the field of a high frieze (315), sometimes extended over the entire facade, even as among the Zapotecs, over the entire monument (320). In regard to quality, the palm belongs to the Maya decorators of Palenque.

420 The insufficient tools forbad to these architectural styles the effects of high relief. They made up by those of engraving or sinking and by that of a marquetry of inlaid stones. The Mayas of Palenque limited themselves to a modeling or sc-

sculpture of their layers of stucco, which was realized with rare mastery.

Still as much, and perhaps more even the taste for sculptured ornamentation, the architectural styles of Mexico and Central America had a passion for polychromatic effects.

Those realized by them are recommended more by the esthetic merit of a warm and contrasted harmony than by the extraordinary quality of the material. The palette of the Zapotecs c comprised almost exclusively white and red; more varied, that of the Mayas was charged with white, black, blue, yellow and red.

The repertory was limited among the Zapotecs to a geometrical ornamentation, which in truth was surprisingly varied; it particularly consisted of the chessboard, frets and other motives offered by woven and embroidered fabrics (320). Among the Mayas, the geometrical ornamentation was in competition with images of men and animals in awkward and rude drawing, and with grotesque or monstrous figures; both were chiefly s symbolical.

451 Section II. Architectural Styles of Andean A America.

In the Andean region and on the western coast of South America may be distinguished two strata of civilizations; on the one hand a primitive group formed by the Chimu, Chincha and Aymara peoples; on the other being that of the Quichuas, developed at the expense of the preceding after the beginning of the 11 th century A.D.

I. Requirements. -- monumental Chronology and Topography.

1. Works of Chimu, Chincha and Aymara Civilizations.

Between 3° and 12° south latitude, ruins -- notably those of a city at Chanchan near Trujillo and of a Temple at Mojeque near Casma -- attest the artistic activity of the powerful a and industrious nation of the Chimur, whose remarkable abilities are shown by its ceramic, textile and metallurgical productions.

Before being subjected by the Quichuas, like the Chimus, t the Chinchas were established between the Andes and the Pacific in the region of Lima, and thus north and south of that city built cities and sanctuaries, whose remains have been found in great numbers in the basins of the Rimac, particularly at Huatica (Huadca) and at Cajamarquilla; of the Lirin, r ruins of Pachamaq; of the Canete, ruins of Hervay; of the Chincha, ruins of the Tombo de Mora etc.

On the elevated Andean plateau and in the vallies between the Cordilleras -- on the one side even to the upper course of the Maranon; on the other as far as Chili -- were peoples, which must doubtless be identified with the ancestors of the
452 existing Aymaras, who left significant and sometimes impressive evidences of skilful practice of the art of building. As examples may be cited in the region of the upper Santa and t the upper Maranon a Palace and a Temple at Chavin de Huantar; a fortress at Huanachuco; and particularly at Tiahuanaco, at the southeast extremity of Lake Titicaca, a group of considerable ruins, evidence of a great undertaking, that was interrupted by the conquest of the country by the Quichuas.

2. Works of the Quichuas.

The Quichua people had its origin in the elevated Andean l lands between 14° and 15° south latitude, and between the Ap-

Apurimac and the eastern Cordilleras with Cuzco as its centre. At the beginning of the 11 th century A.D., under the lead of Manco Gapac, founder of the dynasty of the Incas, commenced a brilliant fortune, which attained its climax at the beginning of the 16 th century, the time at which it dominated Andean America from 2° 30′ north latitude to 35° 20′ south latitude. But its career was destroyed by the success of the expedition of F. Pizarro, completed in 1535.

453 Quichua civilization was propitious to the development of an architectural style. A regime of an enlightened despotism and of state communism produced a considerable demand for works for the government or of public utility -- palaces, barracks, imperial caravanserais, aqueducts, canals and granaries,
454 the ruling of vast territories inhabited by hostile and energetic nations, required good roads [1] and numerous fortresses. By reason of its character, both official and national, the religion offered to the art of building many occasions for e exerting itself in realizing temples, dwellings for priests and convents for nuns. [2] The sovereigns, imperial princes and nobility required palaces. Finally, the beliefs relating to the dead created the need of tombs.

Note 1. A road was established on the elevated lands to c connect Cuzco at one end, Quito and Chili at the other ! Another led from Cuzco to Quito along the coast, which it reached at the mouth of the Chincho and left at Tugbez (frontier of Peru and Equodor.

Note 2. The Quichuas worshipped an immaterial and eternal deity, manifested under the forms of the sun, moon, morning star, thunder and the rainbow. The dynasty of the Incas passed for natives of the sun.

The first evidences of the architectural productions of the Guichuas, in the epoch of the Incas, are divided in two groups.

The first comprises the ruins located at the heart of the empire in the region of Cuzco. The grandeur of that city, b both the political capital and a holy city, is recalled by t the remains of the famous Temple of the Sun -- termed Inti-huari or Coricancha (Golden House) -- erected by Manco Capac a and beautified by the Inca Yupanqui, his ninth successor; by the strong Citadel of Sacsahuaman; finally by numerous porti-

portions of palaces and houses, recognizable in the edifices of the modern city. At Pisac in the valley of the Huillcanota may be seen palaces; at Ollantai-Tambo, a little north of Cuzco, remain the vestiges of a city and a great fortress; at Huilcas-huaman, a strong strategic position northwest of the capital, exist palaces, forts barracks, great storehouses, a well preserved temple and a convent for nuns.

A second series may be formed of Quichua constructions in conquered countries; on the high plateau in an island of Lake Titicaca, regarded as a sacred place, are the ruins of a sanctuary and of various monastic and lay buildings; in the elevated valley of the Huallaga, a branch of the Maranon, at Huanaco-Vieja are very important remains, in whose number is one of the most carefully built and best preserved Temples of the entire empire; in the coast region at Moche, south of Trujillo is a Temple of the Sun; a fortress at Chancaillo near Casma; a Temple at Pachacamaq and a fort and Palace at Hervay.

II. Natural and Human Conditions. -- Influences. -- So Schools and Epochs.

The natural conditions for the development of an architectural style in Andean America appeared differently, according as there is considered the valley of the Cordilleras and the elevated plateaus, or the basins of the tributaries of the P Pacific. In the first case is the abundance of stones, limestone, red sandstone, especially trachyte, basalt, granite a and porphyry, with the harshness of a dry climate having violent contrasts of heat and cold; in the second is the limitation of the structural material to clay, and the regime of h hot dampness of equatorial and tropical countries. A common character is the frequency and violence of earthquakes.

Similarly, and perhaps even more than those of Mexico and Central America, the architectural styles of Andean America had at command unlimited labor. They again resemble each other in that their tools were rudimentary, substantially composed of stone instruments, and of copper to a small extent.

456 The surprising results represented in certain works and the astonishing perfection in execution assume a remarkable orgaization of labor and marvellous technical skill.[1]

Note 1. The Andean peoples, particularly the Chimus and Q

Quichuas, practised with great success the arts of metal-working, ceramics and fabrics. Certain specimens of their abilities are of the first order.

We are ignorant of the origin and evolution of Andean architecture. The opinion, that they are derived from those of M Mexico and Central America is not acceptable. The hypothesis of an Asian affiliation is not absurd, for it is not exceptional for junks to be driven by trade winds and the currents of the Pacafic on the coast of Equador and Peru; only there was no proper communication, merely an accidental and individual influence.

It is certain, that the extraordinary technical quality of the ruins of Tihuanaco and the impossiblity of conceiving the development of a civilization in the climatic and agricultural conditions of the high Andean plateaus require the placing of the beginnings of Aymara architecture in a very distant p part and in more favorable countries.

The examination of the monuments of the Andean America reveals three different styles. A first one is confined to the coast region; two others are peculiar to elevated lands, one preceding the career of the Quichuas, the other being their work. The latter advanced in three stages,and it attained its full maturity, when the empire of the Incas fell under t the attacks of the conquerors.

III. Programmes and their Realizations.

Public and City Works. -- Fortifications.

Their public works ensure to the Quichuas of the epoch of the Incas a place of honor in the history of civilization beside the Romans.

They realized systems of scientific irrigation, comprising great reservoirs, canals in concreted masonry, and finally t the traversing of obstacles by tunnels and valleys by means of aqueducts.

Their great roads, whose duration to our own times shows t their excellence, in the opinion of A. de Humboldt, are "comparable to the finest Roman roads". With a width of 16.4 ft. and macadamized, they pass over streams by suspension bridges and valleys on embankments; they cling to slopes by the expedient of retaining walls, and at need, by a cut into the rock.

The plan of Cuzco reveals the purpose of the arrangement of a city; it distributes 13 quarters about acentral square bordered by the Imperial Palace, the Temple of the Sun, the Convent of the Vestals and the Mansions of the Princes.

One of the most brilliant manifestations of the architectural genius of the Quichuas is their system of fortification. They combined in a masterly way the multiplication, the successive stories and the flanking of the enclosures, furnished w-with strong walls 16.4 to 19.7 ft. high, several receding and concentric terraces, ensuring the defense of the foot of the walls by the expedient of zigzag outlines or of bastions (324,1; 324, 5). They compensated for their ignorance of the gate with leaves by the adroit applications of the artifice of a tr-icy entrance, susceptible of being closed by a barricade 324, 2-4).

458 Domestic and Funerary Programmes.

In its elementary form, the Quichua house was reduced to a cabin (325, 5); it was composed of a rectangular enclosure, to whose internal walls were attached several square chambers, isolated from each other and opening on a central court (325, 3). The windows were often wanting (325, 2), as suitable under a torrid sky, or were rare and always small. Recesses in the walls served for closets. Doors were unknown, openings being closed only by portieres or mats.

The palace was merely a house designed on a great scale. Erected for the sovereign, it consisted of a great enclosure, that the long blocks of buildings, set perpendicularly to the axis passing through the entrance, divided into several courts, the last being reserved for the private residence. In e each were arranged groups of rooms around a rectangular space. Almost always, the elevation comprised but one story (325, 1).

The Chimu palaces of Chinchan present analagous arraogements, differentiated by the doubled enclosing wall and by a more confused arrangement.

In the territory corresponding to Bolivia and south from Peru, [1] the tomb was in the form of a tower (chulpa)(326); Elsewhere it was a cavern excavated in the side of a hill, an excavation in the rock, or even a pit.

Note 1. See the Acropolis of Sillustani.

Religious Programmes.

Chimu, Chincha, Aymara or Quichua, the programme of a temple of Andean America essentially required a great base in the form of a stepped pyramid with a stairway at the middle of t the front side. In the upper country, the terraces were concentric; on the coast, they receded behind each other from t the front of the monument. The Aymara Temple of Chavin de H Huantar is distinguished by the existence of a chapel, designed as a labyrinth, in the mass of its substructure. The top
459 platform bore the sanctuary, and in the absence of actual examples of this, pottery images afford us an idea. In the Chimu and Chincha country, the upper part was formed of small pyramids (327).

IV. Construction.

Earth was the ordinary material of Chimu and Chincha construction. Mixed with bits of reeds, it was generally and directly in the state of tamped earth; for careful building it was shaped in moulds, that it left in the form of rectangular blocks sometimes measuring as much as 31.5 × 13.4 × 6.7 ins. The walls were prudently built battering on both faces.

In the upper country, construction was in stone.

The Aymaras practised two methods; a pile of small stones
460 connected by mortar -- of which the fortress of Huanachuco offers an example; a megalithic construction, as exhibited by the ruins of Tihuanaco.

The dimensions of the latter are given by a certain block of red sandstone 25.3 ft. long, 15.0 ft. high and 4.9 ft. thick, and by the monolithic gateway of Ak-kapanu, whose dimensions are 12.8, about 6.9 and 1.15 ft. (323). Yet the most characteristic trait of the technics of the example presented by Tihuanaco is the marvellous cutting; so much the more admirable because the forms are often very complicated, the material is extremely hard, and that the workmen had not even bronze tools. A competent traveler has affirmed, "that in no other part of the world had he seen stones cut with such math-
461 ematical accuracy as in Peru, and that in no other part of P Peru could anything surpass those scattered in the plain of Tihuanaco".[1]

Note 1. Spier. See the drawings of Stübel. (Die Ruinenstätte von Tihuanacoo

No more than the Aymaras, did the Quichuas fear to quarry and handle masses; witness a certain stone, brought from afar and raised on a hill for the construction of the Citadel of Sacsahuaman, that measures 19.0 × 9.7 × 7.5 ft. ! And they likewise excelled in adjusting the masonry, as we have just noted. In truth, they commenced with a rudimentary construction. But while accepting the rounded shape of blocks produced by the accidents of quarrying, they required an accurate jointing, whatever the weight and the irregularity of the elements (328). Finally, they realized regular masonry and rectangular blocks, that count in the first rank of masterpieces of the kind; so perfect, that actually the thinnest blade cannot be introduced into the joints (329). Yet if the stones are set dry next the outside, they are separated in the interior by a thin layer of mortar.

Like the Aymaras, the Quichuas thought to resist the effects of seismic shocks by the artifice of indented masonry. Thus sometimes a cavity was made in the top of a stone to receive a projection of the same size left in dressing the lower surface of the block set upon it.

A characteristic peculiarity of Quichua construction, and which also distinguishes it from its elder Aymara, Chimu and Chincha relatives, is the very prominently trapezoidal form imposed on all openings (325, 2; 329).

Even monumental Andean architecture crowned its edefices by a roof in carpentry or a covering of thatch (325, 4,5; 330). Yet the funerary towers of Sillustani exhibit a stone covering produced by corbelling the courses (326).

462 V. Effect.

The various artistic productions of Andean peoples attest their passion for effect.

Chimu architecture loved the accenting of a surface spotted by indents, distributed to create an ornamental appearance. It especially employed with remarkable success ornamental or significant frescos.

Aymara architecture sought the effect of secondary relief and sculpture in the measure permitted by its insufficient tools; thus it treated the architraves of openings with reveals and ears, recessed niches with accented profiles in the

surfaces of the walls and carved friezes (328).

As for the Quichuas, they contented themselves with the effect of relief by the appearance of bosses resulting from their method of giving the faces of the stones a convex shape. (329). Singular in ornamentation, they required particularly overlays of massive gold, even on the exterior. Thus on the Temple of the Sun at Cuzco, the sanctuary of the god was entirely covered with gold, and the upper zone of the walls of the entire edifice gleamed with the splendor of the same metal, a finger in thickness and wide as a hand, and a frieze 18 inches in height.

763 Part II. Native Architectural Styles of Oceanica and of Africa.

Chapter 1. Architecture in Oceanica.

Numerous monuments are recognized from the Caroline to Easter Islands and from Hawaii to New Zealand, attesting the architectural aptitudes and activities of the Micronesian and Polynesian peoples. These exist in the island of Malden, in the Marquesas, in Tahiti, Mangarewa and Tongatabou etc. In Pitcairn island, that Europeans found deserted, were found i important substructures, at Rapa were fortifications; paved roads on Huaheine, in Christmas island, streets paved with b blocks of coral; in Easter island, tombs open to the sky or subterranean; in New Zealand were curiously carved works of carpentry; in the island of Tinian, one of the Mariannes, remains of the dwellings of the Chamorros, the ancient inhabitants of the country; at Panope (Ascension island), the dead city of Nanmatal, an Oceanican Venice, etc.

764 The ruins of Tinian and of Panope merit special mention.

The former consist of groups of piers on the tops of which were placed the floors of houses conceived after the formula of the dwelling on piles, placed in two rows 9.7 to 13.1 ft. apart, these supports consisted of a rectangular and strongly diminished shaft, whose sides measured about 4.6 ft. at the base, and of a hemispherical cap with a diameter of 8.2 ft. They are built of stones joined by mortar of coral lime(333,4).

The creators of Nanmatal were skilful engineers. Taking a advantage of the existence of a basaltic plateau at the shore, on which the depth of water did not exceed one foot at low t tide, or three to four at high tide, they realized a marine city covering no less than 104 acres (333, 1). On the eastern side, it is protected against the swell by a sort of embankment and by an angular breakwater, pierced on the protected side by an opening for the passage of canoes. The city was composed of artificial islands measuring 66 to 427 ft. on a side and separated by canals 29.6 to 230 ft. wide. Most of these terraces bore dwellings; but some had a funerary purpose; such as Nan Tauatsch, that rises to 6.6 ft. above the sea, a terrace 230 ft. long and 197 ft. wide, on the surface of which were two rectangular and concentric enclosures, the

465 external one being 29.6 ft. high and the internal 13.1 ft. The construction of these massive terraces is composite; a f facing is made of piles of transverse basalt shafts with a filling of coral, supporting a nucleus of blocks and paved w with basalt (233, 3).

Oceanican monuments date from an epoch in which the population was more dense than now, pacified by powerful sovereigns and disciplined by a patriarchal regime, being capable of undertakings and compelled to united efforts. As for the origin and the evolution of the art revealed by them, these remain enigmatical.

Chapter 2. Native Architecture in Africa.

To the historian of the art of building with mineral elements, Africa supplies no material, except in the Sahara, the Soudan, and in Rhodesia. Also the first and second of these regions, north of the 10 th parallel of latitude, form a part of the area of Mohammedan art. We shall limit our examination to the southern Soudan, where the architecture appears to be properly African, and to Rhodesia.

I. Architecture in southern Soudan.

In the Mandingo country, otherwise termed the upper basin of the tributaries of the gulf of Guinea between the Fonte-Djallon and the Volta, the house is in two stories; the lower one is half buried in the ground and forms a platform, on which is erected a habitation with a verandah (335, 3). From the Volta to the Niger, the dwelling is fortified, at the angles rise towers or turrets; generally, the external wall rises above the roof and is furnished with battlements (335,4).
466 Still farther east prevails a type of small fort on a rectangular plan, above which rise the ventilating flues of the habitation (335, 6).

Everywhere the construction is of earth; the covering is r realized by means of a wooden ceiling beneath a terrace or a covering of thatch, conical or with slopes. The walls are battering.

II. Architecture in Rhodesia.

Monumental Chronology and Topography.

Between the Zambesi and the Limpopo in modern Rhodesia, the memory of the famous empire of Monomotapa is preserved by two groups of ruins. In Mashonaland, southeast of Salisbury, there remain:-- at Umtali and Inyanga, dwellings and forts; at the place called Niekerk ruins, a group of fortifications extending over more than 58 square miles. In Mataoeleland, near and east of Buluwayo, may be seen at Khami, Dhlo-Dhlo, Nanatali and Zimbabwe, houses, military works and strong castles; that of Nanatali is distinguished by the quality of its construction, that of Zimbabwe -- that can be identified with the residence of the sovereign of Monomotapa, [1] mentioned by
467 Portuguese descriptions of the 16 th century -- by the imposing grandeur of its remains, which cover an area of more than

48,500 sq. ft. In these monuments, some have desired to see evidences of a colonization of the auriferous country by the legendary inhabitants of Ophir, even by the subjects of the Queen of Sheba, famous through the Bible. The truth is, that they were the work of Africans; that the most ancient -- those of Mashonaland -- do not appear to precede the 14 th century A.D.; finally, that those of Matabeleland date from the 15 th to 16 th centuries, the epoch of the prosperity of the port of Sofala, which was one of the great markets of Arab commerce. [2] It is noted, that their builders were industrious, and had iron tools at command.

Note 1. This ruin is improperly called the "Elliptical Temple".

Note 2. See the conclusive demonstration by Randall Mac I Iver in Mediaeval Rhodesia.

The demands appear to have been exclusively in the domestic and military categories; the second appears to have been determined by the necessity of protecting themselves from a danger threatening them on the north.

Programmes and their Realizations.

In Mashonaland, more exposed to danger, the conception of the habitation was dominated by care for its defense. The h house was placed on the slope of a hill and near its summit, in the centre of successive concentric enclosures in stories, about 6.6 ft. high, whose outline was that of an ellipse (337,1), as far as permitted by the site, sometimes to the number of fifty. A built terrace compensated for the inclination of the ground, and supported the dwelling and outbuildings; in its mass was reserved a room for security, accessible by a narrow corridor.

In Matabeleland, the house was entirely on the ground, raised on a substructure. A princely castle was composed of an elliptical enclosure, surrounded by a wall sometimes with a thickness exceeding 13.1 ft.; at the centre was a terrace, a also an ellipse, and crowned by a wall, forming a keep, and supporting at about 6.6 ft. above the ground the dwelling of the master, a circular cabin surrounded by cells. Radiating walls separated the sectors; platforms served as bases for t the habitations of the faithful (337, 2,3). In brief, it is

the realization in stone, of the kraal of a chief in modern southern Africa.

It is apparently correct to attribute a religious purpose to two conical towers,[3] which rise in the southern part of the Castle of Zimbabwe.

Note 3. The larger one measures 56 ft. in circumference.

166 Construction.

The masonry is very solid. Its materials are natural split blocks of granite, of average dimensions and approximately r rectangular shape. The masonry is almost regular, thanks to a wise selection of the elements, to rough dressing, and particularly to a careful arrangement (337, 5).

Jointing with mortar is rather rare. Yet the use of a cement, into the composition of which entered fragments of granite, was common for the establishment of an artificial site; for building the wall of a cabin, and finally for strengthening at different heights the masonry of terraces, which was further aided by the insertion of beams in their mass.(337,3).

Effect.

A search for effect is manifested by the arrangements in j jointing, producing the appearance of gables, ropes, herring-bone and chessboard forms, and also by the insertion of courses of serpentine in the elevations of granite monuments. (337, 4,5).

C. G. Ricker

HANDBOOK OF ARCHITECTURE

Part II

ARCHITECTURAL STYLES

Volume 1

GRECIAN ARCHITECTURE

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Third Edition

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Preface.

In the year 1881 appeared in the publishing house of Diehl in Darmstadt the first edition of this work, the second in the year 1891 with Bergstrasse in Darmstadt, and with another edition the house of Alfred Kröner, formerly in Stuttgart and now in Leipzig, comes about the close of the year 1909 before a c circle of professional readers, which has not continued the same during this period of 17 years, like the editors of the Handbook. The conception of the "beautiful" has changed, especially for us in Germany. Taste and fashion have varied much during this short space of time. Many cries of "Hosanna" have been answered by "to the cross with him."

But the interest in antique art remains undiminished, its worth has not lessened, and not merely the upper ten thousand, but likewise the great mass of mankind alwayu still cherishes its ideals, and its material worth has risen to the infinite.

What zeal and diligence in investigation has accomplished toward furthering a knowledge of the antique in Germany, England, France, Italy and not least in the mother country of the Greeks, as well as in youthful America in our own time, is and will remain a golden page in the history of art research.

In many things indeed must opinions be opposed, where secure bases have not yet been won; but this neither can nor should deceive us concerning the value of the labors. "The Greeks are and will continue as the polestar of all our endeavors and will never grow old like the ancients." (Schopenhauer).

To the architect trained in science and practice, to the archaeologist, to the historian of art and the cultured connoisseur, I present the extended work, that utilizes the latest results of research as much as possible. Here the judgement of other circles as well will be no less esteemed, according to the words of Aristotle, "that not in all matters is the executing artist the sole and best judge."

Of that here given, by far the larger portion has been seen by myself, examined and drawn, whether on the fields of ruins or in the museums of our great cities.

Carlsruhe. November. 1909.

Joseph Durm.

THE ARCHITECTURE OF THE GREEKS BY JOSEPH DURM.

1. Introduction and Historical Review.

"The deeper we penetrate into the history of the culture of antiquity, the more plainly do we see how much of this is to the credit of the culture of western Asia. And in the consideration of Grecian and Roman art may one observe how much of this highly elevated art recalls Egyptian and Assyrian prototypes.

The Greeks were intimately connected with the Phoenicians, the latter were settled nearer the Grecian lands, until they set foot in Euboia itself, opposite Athens. And they also assumed the part of an intermediate between Egypt and Assyria on the one side and between the Greeks and Romans on the other.

As a final basis, we repeat that Grecian art goes back to Assyrian prototypes. Assyrian innovations first affected Egypt. And from Egypt they were brought to the Greeks by the mediation of the Phoenicians. The Phoenicians also received them directly from the Assyrians and also naturally transferred them directly to the Greeks."[1]

1. Babel-Bibel in den modernen Kunst by Heinrich Pudor. P. 57. Berlin. 1905.

But it will not be forgotten here, that the mutual acquaintance of the Egyptians and Assyrians, sword in hand, also without Phoenician mediation, may be dated back very far, and that in such contests a victor would appropriate so much from the other, as is shown by the art products of both nations.

Under Thothmes III (1597 B. C.) -- thus about 400 years before the Trojan war -- Egyptian armies were in Assyria, and in 1362 B. C. Rameses III again led his Egyptians northward to Asia Minor and eastward to the Tigris. The visit of the Egyptians in Mesopotamia was first retaliated by Cyrus' son Cambyses in 525 B. C., when they had already opened some of their harbors to foreigners (Greeks in Naucratis) 129 years earlier. Not trade alone causes travel, but likewise long and great wars and conquests do their part towards the transformation of art and art industry.

We should err in desiring to lessen the merit of the culture

the valley of the Nile in favor of that of western Asia. In its improvement Egyptians and Assyrians took an eoual part.

From a purely technical point of view, the subdivision into groups of Grecian monuments according to the use of available building materials, according to their peculiarities and degree of hardness, according to the mode and the possibility of working them, according to the working tools employed and the materials of which the latter were made, may be examined, enumerated and classified accordingly.

Walls of stone of varied hardness and of bricks already in the earlier period enclosed the rooms, stone and wood served to cover them, and from bronze and iron were the tools made, with which the workman prepared the different materials.

To bronze tools were the Greeks restricted for the buildings of the premycenean and mycenean periods, and they adhered to these, as shown by the masons' marks and the stonecutters' ch chips found in Mycenae and on Crete. Phaestos, Cnossos, Gournia -- localities of the "intermediate isle of nations," whese Italian work of excavation, English energy and liberality, and American zeal [1], have brought to light such astonishing results, -- Mycenae, Tiryns, Hissarlik (Troja - Ilion), Orchomenos and other places prove by their defensive walls, tombs, fortresses and palaces, that in these were the same technical expedients employed, and that by perseverance and without being appalled by the great toil, the most extended methods of dressing stone were executed with bronze tools, that were later and more easily performed by the use of iron tools, which first became common in the 10 th century B.C.,[2] when it should not be concealed, that the Egyptians already for a long time had known how to work the hardest stone (granite) with iron tools, before the people of the West could do this. [3] Homer mentions only b bronze axes, the toothless saw (for cutting stone by the aid of sand), that have left their marks on the entrance portal of the Tomb of Atreus at Mycenae, while the toothed saw is assumed to have been unknown, though erroneously.

1. *Duhn, F. von. Deautsche Rundschau. (Heft 12). Berlin. 1903. Also Milchhöfer, A. in the same. Berlin. 1902.*

2. *Handbuch der Architektur. Die Baukunst der Etrusker und*

Römer. Chapter 1. Prefatory Remarks. P. 7 et seq. 2 d edition. Stuttgart. 1905.

3. Maspero found iron tools in the oldest pyrameds.

We shall also not refuse to consider the art of setting these toilsomely wrought ashlars (Towers in Tyrins, walls at the Lions' Gate in Mycenae, the walls of tombs and doorway lintels there, with ashlars over 19.69 ft. long etc.), as well as the scaffolds of massive carpentry and the arrangements for hoisting, as well as the skill and perseverance in hoisting these colossal ashlars and bringing them to their places.

We might thus separate the structures of the bronze and the iron periods and so describe them, but it is still preferable to pursue the ancient course, to take up things according to their purposes.

Structures of ashlars wrought with "bronze tools," with large stones joined without mortar, or masonry of quarried stones of moderate size with earthy sand in the joints, the larger stones connected by wooden dovetails or those of bronze without cast lead, only serving to strengthen the bond, the so-called stonecutters' marks on the external surfaces of the ashlars, walls of airdried bricks with or without straw or chopped reeds and set perpendicular to the wall with imbedded wooden timbers parallel to the external surface of the wall, and an omission of fixed architectural members with corresponding ornaments, were characteristics of this first group. In it the clear architectural details were replaced by oriental and richly sculptured surface decorations of costly materials in varied colors; the buildings were protected by terrace roofs of clay, and the monumental covering of the openings and enclosed rooms occurred by corbelled courses of stones.

On the works of the "iron period" the surfaces of the ashlars were smoothed in various ways; their faces received simple dr drafts or special margins and angle drafts, both for polygonal and horizontal coursing. The dressed stones were strongly bonded, but were still set in courses without mortar and with the closest jointing; the end joints received a sinkink, except at their edges, headers and stretchers alternated properly, and for greater security, the stones were fastened together by iron

pins in the top and bottom with N, T, U or H-shaped iron cramps set in cast lead. The paneled marble ceiling replaced the wo wooden ceiling and finally gave place to a vaulted one; instead of the horizontal corbels appear the wedge-shaped cut voussoirs, and also burned bricks and lime mortar made airdried bricks and clay mortar impossible. Gable and shed roofs with clay and m marble tiles took the place of the terraced clay roof, the external surfaces of porous stone disappeared beneath plaster or stone slabs, and exposed places were in many cases covered and protected by brightly painted terra cotta slabs.

On the architectural members the relief and painted ornament appeared effectively; a fixed canon for architectural style with the aid of high relief, as well as monumental painting on the exteriors and interiors of buildings, makes itself apparent. The stonecutters' marks on the external surfaces of the stones vanished, but on the other hand occur on the hidden surfaces, the arrangements for raising the ashlars, which consisted of perforations, U-shaped grooves, rectangular projections, or straight holes in the beds in the oldest period, of lewis holes in the later ones. The final facing of the stones then took place after setting, as shown by the working marks and l lines on many walls, the various bosses (angle and edge ornaments) and the but partially cut flutes.

For the following works is assumed a subdivision according to definite periods; first that comprising the premycenaen and Mycenaen structures, then the porous architecture and the works until about 479 B.C., afterwards those of the classical period till 332 B. C., and lastly those of the Hellenistic-Roman period until 180 A. D.

Let us then consider in the domain of architecture the masterworks of Hellenic art transmitted to us, and we shall then meet therein with two predominating architectural styles, sharply separated during the best period, and which we designate by the names of Doric and Ionic.

As already stated, in these are contained architectural traditions from Egypt and inner Asia.

The forms came to Hellas developed to a certain degree, but there experienced that transformation, that is authenticated

as the highest degree of artistic perfection in the treatment of form in all times; "thus it bears the character of an organic necessity, that rises to a model, yet not in the dead sense, as if it were incapable of development and transformation."

Details of both styles indeed also occur on the same monument. Such a mixture may indeed be regarded as the harmless beginning of the decadent end.

From this mixing is indeed to be separated the well known u use of both orders, already fixed in details, on certain buildings, and which was never entirely excluded, even in the best period.(Propyleion in Athens, Temples in Phigaleia and Tegea, a temple in Paestum, the Philippeion at Olympia, the Tholos at Epidauros, etc., as well as Figs. 2, 3).

Not in the invention of new forms, but in the selection of those transmitted or introduced and in their inspiration does Grecian art employ itself. It could only in time and by steps of transition attain to that high perfection of form. Therefore we need not regard the perfected Hellenic art style as a direct development of that existing or invented earlier; it is far more the result of a new intellectual perception, that shaped from existing forms its own particular ones, whereby was also not excluded the realization of independent elements, native to the settled people.

The orders (the modern designation for the perfected separate styles of architecture) are the results of the same intellectual labor, that created the orderly separation in the varied mixture of traditional forms. From the ruins of earlier native and foreign elements have proceeded the formative art; we everywhere meet with the characteristics of their secondary origin.[1] Every people, that has neighbors more advanced in culture, will adopt from them and make their arrangements its own; an absolute originality cannot therefore occur for a less perfected or undeveloped culture, when one more fully perfected lies beside it. But the experience in all domains of art teaches, that imitation precedes originality, and that the latter first appears, when men still possess the power to create something from what is received -- the Hellenes had this power!

1. *Semper, G. Der Stil in den technischen und tektonischen*

Künsten etc. 2 d edit. Munich. 1860-1863.

But the civilization of inner Asia and Egypt was already developed, before men thought of adorning Hellas by art works. The countries mentioned were not isolated, they shared their attainments with other peoples. The transmission of culture was by the Phoenicians, the people of Sidon and Tyre; Asia Minor formed the bridge between the civilization of Mesopotamia and of Greec. [2]

2. Also see in this sense, Milchhöfer, A. Die Anfänge der Kunst in Griechenland. Studien. (introduction, p. 1-4). Leipzig. 1883.

Thus not perfected, like Pallas Athene from the head of Jupiter, did the forms and orders of Hellenic architecture originate; their splendid fruits were slowly matured; the various t transition steps to ripeness were unfortunately frequently fragmentary, or have entirely disappeared.

Since they are not wholly original and since comparison almost never occurs, the severe forms of the Doric and the graceful ones of the Ionic styles of architecture have little to do with the character of the people. For example, the Spartans are usually taken as representative of the Doric race; by them were scorned every art industry and manual work as unworthy of a freeman; their architects were therefore foreigners or the subjugated Achaians; the Dorians of Corinth and of Syracuse w were accounted as the most luxurious and extravagant inhabitants of all Hellas. The men of Tiryns, the builders of the gigantic walls there and their successors were esteemed foolish and ridiculous. [3]

3. Braun, J. Geschichte der Kunst etc. Wiesbaden. 1856-1858. 2 d edit. by Reber. 1873.

Thus not to the demand of the people are due the most splendid architectural monuments of Greece, but to the intelligence and the determined will of individuals -- highly cultured rulers -- thus in Athens to that monarch in the cloak of a republican -- Pericles.

As in the case of so many of the distinguished and great, the greater part was not called into existence by, but contrary to the wish and desire of the great multitude, an occurrence that also still happens hourly, and especially with us Germans.

Compare similar events in the golden age of the Renaissance.

"He gilded our city and decked it out like a vain woman; he squandered all the money and ruined the finances;" thus men spoke in his time of the man, who made Greece immortal. However highly the work was esteemed, and even if certain artists were honored by the personal friendship of elevated patrons, still a passage in Plutarch casts a peculiar light on the social position of the artist, at least in the 2 d century A.D. "The practice of a low business is equally opposed to the better. No youth of noble nature has seen the Jupiter in Pisa or the Juno in Argos and therefore desired to become a Phidias or a Polycletes. Just as little does he wish to become an Anacreon, a Philetas or an Archilochos, because their poems have pleased him. [1]

1. Compare the still more severe judgments in the 4 th century B.C. in Aristotle's Politics. Book 8. "On Education." 2, 3, 4, 6 and 7.

More compulsory for the treatment of the architectural forms was and remains the nature of the building materials, that were at the command of the people or of individuals for the embodiment of their architectural ideas. Up to a certain degree, one may regard every architectural style as the product of two factors; these are the genius of the master and of his time on the one hand,and the quality of the materials supplied by nature on the other. [2]

2. See Suess in Hauenschild. Katechismus der Baumaterialen. I Theil. P. 3. Vienna. 1879.

The form of an architectural style is not compelled by the climate of a country. The Ionic and Doric architectural forms sprung from the sunny and luxuriant soil of Asia, and transmitted from the fruitful, hot and rainless Egypt, struck root and produced flowers and ripe fruits on the stony soil of Hellas, never characterized by luxuriant vegetation; they also survived the severer climate of a land, of a portion of which Hesiod sings:- "Where bad is the winter and evil also is the summer, and naught is good. Here is no longer the pleasing alternation of the seasons of the year (as Herodotus says of the Ionian c coasts); sheepskins, sewn with ox sinews, are thrown over the

shoulders against rain and snow, and a shaped felt is placed over the ears, that they may not drip. On the contrary in summer, the plough and sickle are used in entire nudity, and the glow of the dogstar dries up the marrow of men." Attica, with its but sparsely watered stony soil with a thin covering of earth, is also called by the poets the stony or rough.

The graceful filagree and perforated, often heaven aspiring and finely membered architecture of the Gothic style, with the roof gutters and intersections collecting an abundance of water and snow, is hard to bring into accord with our northern climate, and it awakens important reflections against the acceptance of a relation between architectural form and climate.

Porticos, loggias, balconies and bay windows are as native in the North as in the South; the bay window is a characteristic peculiarity of the Arabian and of the northern Gothic dwelling. [8]

8. *Ebers, G. Aegypten in Bild und Wort. (Street in Suez. II. P. 29. Street in Cairo. II. P. 108. Street in Copts' Quarter. I. P. 198.). Stuttgart & Leipzig. 1879-1880.*

Like its precursors, Grecian architecture became one in stone, and it is indeed a fact, that most Greek settlements were founded, where usuable building stone was abundant in the immediate vicinity; take only Mycenae, Athens with the limestone quarry of Lycabettos near at hand and the Pentelican quarries but a few hours distant, Syracuse, Akragas, Selinus, etc. But it c could only become a stone architecture by preliminary steps a and transitions, as also the case for its predecessors, those of Egypt and of Asia Minor, and indeed for like reasons.

Wood and mud (earth) are the earliest building materials in countries without stone, or at the time that men did not understand stonecutting, and textile fabrics, wood and metal received decorative architectural forms.

Evidence that wooden architecture preceded stone architecture is afforded by the rock-cut Tomb of Beni-hassan in Egypt, whose cornice imitates wooden construction. (Fig. 4).

For the buildings that served as prototypes of these tombs, men indeed only replaced the wooden columns by stone columns and left evidence of their origin, the cap form between the

support and the architrave.(Fig. 5).

Thus at a certain time originated there the mixed architectural construction of wood and stone, in place of which must appear that entirely of stone.

In the ancient structures of Susa and of Babylon is contained the original type of Asian architecture. Thick walls of airdried bricks covered by vaults or by terraced roofs, according to the lack or the abundance of building woods, characterize them.

Trunks of trees served for covering as well as to strengthen the masonry, and a facing of burned and glazed bricks protected the airdried bricks from decay. Tunnel vaults and domes on pendentives were already built in the time of Darius. Cuneiform texts mention cedar posts decorated by gold leaves, that supported a timber roof covered with skins of animals.

The Bible tells us of the carpentry of Solomon's Temple and Palace, with the contemporary use of stone for the substructures, and Strabo permits in Babylon the columns (beams and posts) to be made of palm trunks on account of the lack of stone, and these were wound with ropes of twisted straw and painted with colors, as well as the doors with asphaltum.(Book 16, Chap.1).

The combination of wood and stone can likewise be shown on the ancient tombs of Cyprus. [1] The Temple at Agios Photius on Cyprus, built before the Hellenic influence - very simple in architecture, the cell entirely constructed of unburnt bricks, thickly plastered internally and externally and whitewashed - in accordance with a custom still retained there to this day in the building of halls and porticos, had the shafts of columns of wood, while the bases and capitals were made of stone.

1. Cesnola, L.P.D. Cyprus, its ancient Cities, Tombs and Temples. 1879.

Likewise compare the traditional mode of construction in Lycia, as it is preserved in that flat country, of which Fig. 5 gives an example.

The later stone columns in Asia Minor incontestable indicate wood as the original material, and they are in a certain sense the archaic prototype of the Ionic stone column.

The Lycian rock-cut tombs accurately reproduce an ancient w

wooden house, from which was developed a stone monumental structure under changed conditions, while on the Persian monuments greater freedom occurs,for all ornament is suppressed on the latter, that recalled too strongly the abandoned wooden construction.

Where nations in communication with Egypt and Asia received their civilization from the former and columns came into use in architecture, the "slender columns" are to be referred to Asian and the "thick columns" to Egyptian origin.

Close and wide spacing depend on the style, the nature and the resistance of the architrave beam lying thereon.

We learn from the poems of Homer, that enclosing walls and partition walls were made of stone and were covered by wood, metal and tapestries. The roof consisted of beams with a layer of earth, when the ceiling beams were of lighter wood and were supported by girders resting on posts.

The development, climax and decadence of political and artistic life may have proceeded as illustrated in the following summary.

After the Trojan war occurred in Hellas still frequent changes of sites and foundations, so that the country could not yet develop in peace and prosperity.

The long absence of the princes and warlike men during the trojan war from their household hearths afforded to aspirants remaining at home abundant opportunities to create complications of all kinds, that required solution by the sword. Transfer of possessions, emigrations and immigrations followed the bloody dramas; thus in the "eightieth year" after the fall of Ilion, the Dorians in league with the Heraclides took possession of the Peleponessus.

The most fruitful regions of Thessaly, Boetia and a part of the Peloponnessus most generally changed their inhabitants, and Hellas only painfully attained to quiet and orderly conditions, which were first enjoyed by Attica,in particular. On account of its small area, this country chiefly remained from the earliest time free from changes, and the Athenians proudly called themselves aborigines or natives, the oldest people, that alone among all Hellenes had not changed its dwelling

place." Thucydides sees in this a basis for the high culture of Athens in comparison with the other states. Important men appeared in various states as lawgivers, arranged public occurrences, and after quiet conditions obtained, prosperity increased. Men built fleets, sent out colonies, and thus the Athenians populated the Ionic domain and most of the islands, but the Peloponessians occupied Italy and Sicily.(See Thucydides). The stream of the peoples, that originally flowed from East to West again in part returned eastward; moreover the Trojan war may already be regarded as an unsuccessful colonizing expedition toward the East.

Also about this time the names of "Hellas" and of "Hellenes" may have been assumed for the entire fatherland and the peoples allied by origin, since the epic poets living after the Trojan war still employed Danaids, Argives and Achaians as a general appellation.

It was likewise the Athenians, who first adopted a more comfortable mode of life, and dropped the barbaric custom of bearing weapons, caused by the insecurity of former conditions. As an expression of the national fellowship were founded the Olympian games in 776 B.C.:- in 670, we find Grecian colonists and mercenary soldiers in Egypt; about 600, Grecian colonies extended from the Black Sea even to the western Mediterranean. Likewise the northern coast of Africa received a Grecian colony in the founding of Cyrene by Battos from Thera.(631 B.C.).

These colonies were not mere trading stations, as with the Phoenicians; they were to be the means of providing new and b better locations for an increasing population in the mother country.

In Asia Minor, the Aeolic, Ionic and Doric colonies soon excelled the fatherland in the culture and care of the fine arts and even exerted an important influence upon it. The twelve cities of Miletus, Myus, Priene (in Caria), Ephesus, Colophon, Lebedos, Teos, Erythea, Clazomenea and Phocea (in Lydia), the island cities of Samos and Chios attained wealth, culture and importance, aroused the envy of the princes of Lydia (617-504 B.C.), otherwise not well inclined toward the Hellenic races, and these finally became tributary to them. By resistance to

them, Miletus lost its Temple of Athena, but received for it two new ones built by Alyattes. The rich and art-loving Croesus sent to Ephesus golden cows as consecrated gifts together with many columns of the Temple, he sent to Delphi 117 golden half bricks, on which was represented a golden lion, a silver and a gold mixing vase, the first of these holding 600 amphoras (5400 gallons ?), 4 silver vessels, silver and gold sprinkling vessels, silver castings and a golden female figure 3 ells high, to the Temple of the Ismenian Apollo at Thebes the golden weapons dedicated to Amphiauros (which Herodotus still saw), and he sent to the Spartans gold for the figure of Apollo on the Thornax in Laconia.

After the fall of the Lydian empire, the easy yoke of the Lydians was succeeded by that of the Persians under Cyrus. The cities of Magnesia and Priene were sacked by Mazares, Phocea was taken in spite of its walls, excellently constructed of great stones. Under the successor and under the rule of Darius occurred a rebellion of the Ismenians, projected by the Milesian Aristagoras and with the aid of Athens, in which Sardis was laid in ashes, the seat of the satrap Artaphernes and the former residence city of Croesus, whose houses were frequently merely constructed of reeds, or were of airdried bricks with roofs of reeds. A Temple of Cybele was thus destroyed, which occurrence later served the Persians as a pretext and excuse for destroying the Grecian sanctuaries. Miletus was reconquered by the Persians, and then the Sanctuary in Didyma with the Temple and Oracle were plundered and burned. The Persians armed for a campaign of revenge toward Athens, which had meantime taken a splendid course of development under the rule of the art-loving Pisastratides. The market-place was laid out, the acropolis was adorned by magnificent buildings, and the g great Temple of Zeus commenced (538-510 B.C.). Smaller contests of the Hellenic states with each other in this time were not obstructivy to the progressive arts and sciences.

Under the guidance of banished Hellenes in 490 B.C., the Persians invaded Hellas, devastating the province of Eretria in retaliation for the fate of Sardis, plundering and burning temples, until they were beaten on the plain of Marathon and com-

compelled to retreat. Attica was saved at first. Ten years later, Xerxes passed the Hellespont into Europe with an imposing army, first conquered all Phocis, burned villages, set fire to cities and overthrew temples; the rich Temple of Apollo at Abea with its rich treasuries and consecrated gifts was then destroyed.

At Panopeus the army divided into two forces; the larger continued with the king to Athens; the other portion passed to the road of Delphi, laying in ashes the cities of Panopeus, Daulis and Aeolida; Delphi itself escaped destruction and plundering, apparently by a miracle and the action of the elements. With lightning and thunder, rocks were torn loose from Parnassus at the approach of the barbarians, rolling down upon the storming hordes, who were terrified and amazed, fleeing from the wrath of the deity!

Thespia and Plateia were burned, the abandoned lower city of Athens was destroyed, the temples plundered, and the sanctuaries in the citadel were destroyed by fire. "After the departure of the Persians, very little of the enclosing walls were standing; the houses were destroyed, except a few, in which important Persians resided." The day of Salamis (480) put an end to this destruction; a year later and after a bloody overthrow near Plataea (479), the remains of the Asian invasion left Hellenic soil. On the same day as at Salamis, the attack of the Carthaginians on the Grecian colonies of Sicily was crushed; Gelon destroyed near Himera the African army.

No abundant material in architectural works remains for us from this period until the oldest stone temples on Hellenic a and Italian soil; many gaps before the masterworks of the 6 th century are to be mentioned. Even if the excavations in Mycenae and Tiryns, in Troy and Olympia, have extended our knowledge of the entire species of buildings of the early period, we are not in condition to correctly givv on all their parts the construction and arrangements of the houses of the gods in the e early period. And if we base hypotheses on the drums of columns, the substructure and the few remaining ashlar courses of the Heraion in Olympia, whose purport extends even to the 9 th and 10 th centuries B.C., no positive image results.

In contrast to the arrangements of the splendor-loving and rich Asians, the public and private buildings of the Hellenes may have been still simple at about the time of the battle of Platea. Pausanias, the general, was amazed by the tent of his adversary, decorated by gold and silver, the couch covered with gold and silver, the golden mixing vessel and cups, by the sa sacks filled with silver and gold cups, the table of gold and silver, and all the splendor of the feast. Therefore he ordered the preparation of a Spartan meal, called the leaders to h him and addressed them:- "Ye Hellenes, I have caused you to be assembled, since I desired to show you the folly of the Median commander, who led such a splendid life and yet came to us, in order to deprive usof this poverty, in which we live." -- The simplicity of the dwellings was previously referred to; t then one must not forget, that the Hellenes were a free people, jealous and mistrustful to the extreme, inclined to criticism, and economical with money. No citizen dared to make public his prosperity, in order to not arouse democratic feeling by visible luxury, which might at best have produced envy and evil suspicions. Alcibiades first had his house painted internally.

The Greeks did not have at command the treasures and slave hands of the Egyptian and Persian kings; they had no multitudes for willing service in the erection of their works - they sought to win excellence by beauty and choice in form, that one must find in their works. Thus they avoided in their buildings the multitude of architectural motives, an overloading with ornaments, a heaping of amazing details; in the temples, public buildings and dwellings, simplicity is the supreme law. The workmen were proud of their work and regarded it with consciousness. To this fact, which indeed sometimes increases beyond sufferance, it is due, that most Grecian works exhibit such faultless execution. [1]

1. Viollet-le-Duc. Histoire de l'Habatation Humaine etc. P Paris. 1875.

Religious feeling and belief were firml: rooted in the people before and during the best period, even if the cultured rulers might think more freely of the world of the gods interwoven with all the defects and preferences of the character of

the Hellenic people. The belief of the people in a deity, the overlooking of this made it possible for the Pisastratides to execute an attack on Athens. "A woman from the region of Paeae and of such great size, nearly 4 ells in height and of beautiful form"was completely armed and placed in a chariot, that t the Pisastratides followed with their adherents; heralds announced her as Pallas Athene, whom Pisastratos was taking back into her city; the people believed, prayed to her - and the attempt succeeded.

Great care in the service of the gods busied the Hellenes; it was then strongly held, that the sanctuary should not be desecrated. Traffic with women within the sanctuary was not permitted, nor even for them to visit it while unpurified.Egyptians and Hellenes here applied the same laws, while nearly all other parts of the world then known to men permitted the same freedom in the houses of the gods and within the sacred enclosure as to animals. [2]

2. *See Herodotus.*

If the gods were also conceived to be just and perfect beings, yet their priests on earth were somewhat more pliant. The Alkmaonides, who fled from the Pisastratides, built the facade of the Temple in Delphi of Parian stone instead of tufa, as agreed on, in order to win the oracle to their purpose, and by increased expense, they attained their end; even Persian gold was not scorned, and the national concern was subordinated to gain - the oracle overawed the Athenians rather than encouraged them to fight for freedom. The gratitude of the king for the good service perhaps protected the Delphic priests more than the reported doubtful attack.and miracle.

Freed from distress by the barbarians, the Hellenic people in the mother country and the colonies recovered, and arts and sciences under the lead of highly gifted statesmen took a flight never equaled.

Conditions certainly improved, and particularly Athens, that appeared at the head of the Hellenic states, showed by the sp splendor of its successive public buildings, that its much va vaunted power and its ancient prosperity were not falsehoods. The highminded Pericles, "the Olympian," assumed the control

of Attic state affairs; money was sufficient and the city was supplied with all needs for a war. Therefore he believed that he should employ the surplus means for objects, that after their completion should as strongly win eternal fame, as that they should be a source of prosperity during their erection.

Thus without delay, he placed great designs in execution and artistic plans for works of longer duration before the people. As Plutarch states, the building materials were at hand - stone, metal, ivory, gold, ebony and cypress wood. Likewise were fo found the trades required for their preparation and use, since there were:- carpenters, sculptors, smiths, stonecutters, dyers, workers in gold and ivory, painters, embroiderers, carvers, and then the laborers for the transportation and conveyance of all this:- pilots, sailors and steersmen for the sea, for the land teamsters, horseboys, drivers, ropemakers, linen weavers, saddlers, roadbuilders and miners. Finally were assigned to each trade a multitude of lay helpers, to take the place of mere tools and to give their bodies to the service. At such a locality all these requirements extended and scattered a rich prosperity over every age and every capacity.

The works gradually arose, splendid in their magnitude or inimitable by their form and beauty. All masters strove to e excel in manual work by successful execution. Yet the rapidity earned the greatest surprise. Things that men believed that each one would only be completed with toil for many generations and ages of men - these things were completely executed within the time of a single government.

In beauty each work from the beginning attained to the prototypes of antiquity, while by its refined and blooming charm it is yet fresh and animated until today. So strongly does a certain bloom of eternal youth rest thereon and protect the entire appearance from every effect of time. It is as if a breath of eternal spring had touched these works - a spring that can never change! The Parthenon, built by Ictinos and Callicrates, the Temple of the Mysteries at Eleusis, commenced by Coroebos and finished by Metagenes and Xenocles, the Long Wall of Callicrates, the Odeion, whose external form was in imitation of the tent of the Persian king, and the Propyleion built by

Mnesicles, are works of this period. The great Phidias, the friend of the "Olympian", created the golden statue of the goddess and supervised all the undertakings; the latter had m made of Athens a great city, one of the largest and richest; by this it became the school of culture in Hellas, indeed of the entire world. Power and wealth should first of all serve art; for works of architecture and sculpture were expended in the last 20 years before the Peloponnessian war at least 8000 talents in the small state of Athens, thus more than ten, millions of dallars. "But if these sums had not then been spent in producing perfect works, when all the elements existed, - this moment would have never returned."

But not merely in the mother country, yet likewise in the colonies pulsated a new and active life. Sicily cultivated architecture first of all during the time from the fall of the tyrants until the second invasion of the Carthaginians. Men carried on with great zeal the temples begun under the tyrants and undertook yet greater and more beautiful ones, corresponding to the advanced art culture. A great part of the temples and aqueducts at Syracuse, Akragas, Selinus and Himera originated between 480 and 450; the oldest temple in Selinus perhaps already before 600, the latest in Egesta shortly before the invasion of the Carthaginians in 410 (if Holm be incorrect in t the possibility of its erection shortly before the destruction by Agathocles in 307). Among these the Temples of Olympian Z Zeus at Selinus and Akragas belong with the greatest in antiquity; both were never completed and never surpassed in magnitude only by the Artemesion in Ephesus. "They built as if they would live forever, and ate as if they would die on the morrow -- in the most beautiful city of mortals." The Italian colonies, in the temples at Paestum and in the temple ruins at Locri exhibit splendid proofs of their activity in art.

More sparing are the stone tokens of the blossoming on the soil of Asia Minor, affected by wars, and on the islands. The national sanctuary of the Ionians, the Artemesion at Ephesus, was spared by the Persians, and only the Temple of Miletus was rebuilt after the Persian war as a monument of importance; the Temples in Sardis, Priene, Magnesia, Teos etc. are referred to the 4 th century B.C. and even later times. What remains to

us of all this splendor? -- Considerable for the length of time, that has passed since the time of Pericles until our day, and yet too little to afford a sufficient representation of an antique temple with all its peculiarities. If likewise the plans of the different monuments are determined by repeated measurements, the forms of the details made known by drawings of all kinds, there are yet wanting to us certain structural arrangements, the ceiling of the cell and the construction of the roof,of the temple, the desirable starting points on the works. Concerning these arrangements opinions are very much divided and must so remain, until a fortunate discovery places in our hands more perceptible materials. Whether this case may ever occur in the present condition of the known monuments must be very doubtful. Even the soil of Olympia gave no answer to the questions of this kind.

The various attempts to restore antique temples to their original form, or the dimensions of all kinds of temples, the l lighting, construction of roofs and ceilings of temples, are and continue to be chiefly more or less ingenious hypotheses. Under these circumstances, the facts longest known require no special confirmation, that our acquaintance with Grecian architecture is always limited; also the most thorough revision of all illustrations (we have indeed done this fully) and the most accurate research in breadth do not fill the gap. To numerous publications of details in the modern period, we indeed o owe conclusions on the present condition of the monuments,that truth of statement has taught how to distinguish between so m many notable publications and has improved defective details; but they give us no information concerning that irrecoverably lost. Not even the dates of erection of most monuments are known and attested to us, and we must here also be frequently satisfied with "about."

The best preserved Doric monuments are the "Theseion" and the Parthenon in Athens, built of marble, with the so-called Temple of Concordia in Akragas, constructed of limestone,and which afford definite conclusions relating to the arrangement and construction of the external architectural members and the ceilings of the porticos; the so-called Temple of Poseidon

in Paestum, that presents a representation of the interior; t the arrangement in 3 aisles, the small columns above others, only leaving open the questions of the ceiling and of lighting. Nearly all other monuments have fallen a sacrifice to the power of the elements and man's love of destruction, and merely remain only in more or less doubtful ruins. For this material reference is made to the following Sections.

Pestilence and war, foreign and internal commerce of the different states, the mysterious conflict between Athens and Sparta, that continued nearly 30 years (431-404 B.C.) with varying fortunes, ended with the downfall of Athens and consumed the marrow of all Greece, reduced the means and the taste for monumental art; the people, that had previously undertaken the highest things became "loquacious and avaricious, corrupt and cowardly;" its freedom was buried on the day of Cheronea(338). In the dazzling appearance of an Alexander (336-323) Grecian genius afterwards flared up and indeed produced on Asian soil art works of importance and elevated beauty, but the chaste fragrance and the pure charm of the products of the age of Pericles were lacking in them. Under the patronage of the tyrants (405-365) in Sicily, there continued to bloom the arts and sciences in different places; the noble Timoleon created orderly conditions (344) favorable to architecture; but the people no longer possessed energy and passed under the rule of foreigners. In the year 264 the Romans took possession of Sicily.

In place of Athens, Alexandria (323) became the centre of Grecian literature and art; under the vain and splendor-loving but artistic princes of Pergamon, Grecian art lived through a later blossoming, convincing evidence of which is afforded by the finds deposited in the museums of the capital of the German empire.(Best period 241-138). Hellas came under Roman rule in 196; the political and the artistic power of origination of the people were thereby destroyed. The culture cities of art, Corinth (146) and Athens (86) were taken by storm and destroyed, Asia Minor (64) was declared a Roman province, the art works of Greece wandered as booty to eternal Rome.

Fulvius Nobilior carried away 785 bronze and 230 marble stat-

statues from Aetolia and Acarnania; Aemilius Paulus employed in his triumphal campaign 250 wagons for the plundered statues and paintings; Sulla even removed single columns of the Olympeion from Athens to Rome.

These art treasures and the Grecian captives interned in Rome and among Italian landscapes afforded the next opportunity for the spread of the Grecian art style into foreign lands.

"Still conquered Hellas again subdued the wild victors and brought art to Latium."

By Hadrian's favor in 117-138 A.D., Athens and the cities of Asia Minor acquired a new but transitory splendor, to then pass into oblivion, to lend again to the art of the modern period clarifying and rejuvenating energy after the excesses of the 17 th and 18 th centuries.

CHRONOLOGICAL TABLE. [1]

1. See Chronologisches Uebersicht V. P. 53 and Zur Geschichte der Griechischen Kunst VI. P. 61 et seq., recently edited by Professor R. Kekule, by Dr. R. Zahn in K. Baedeker's "Griechenland." 4 th edit. Leipzig. 1904.

1. Earliest Time to Persian Wars.

B.C. 2000. Pelasgians are the earliest inhabitants of Greece.

1500. Aeolians, Ionians, Dorians (Hellenes).

1194-1184. Trojan war.

1104. Dorians under Heraclides occupy the Peloponnessus.

1000. Aeolic, Ionic and Doric colonies on the coast of As Asia Minor.Asia Minor.

776. Commencement of the Olympiads.

734. Founding of Syracuse by Corinthians.

707. Founding of Tarentum by Spartans.

560. Pisastrates, tyrant of Athens.
Grecian colonies in Asia Minor become subject to the Persians.

510. Reform of constitution in Athens by the Alcmaeonide Cleisthenes.

2. From the Persian Wars to the Death of Pericles.

492. First campaign of Persians against Greece.

490. Second campaign. (Battle of Marathon).

480. Third campaign. (Battle of Salamis).

477. Primacy of Athens.

465. Cimon. Conquest of Chersonesus.

460-456. Campaign of Athenians against Egypt.

445. Age of Pericles.(Polygnotus, Phidias, Ictinos, Mnesicles, Sophocles, Herodotus.

431-404. Peloponnessian war.(Thucydides, Euripides, Aristophanes, Hippocrates, Polycletus, Socrates.

430-429. Pestilence in Athens. Death of Pericles.

3. From Pericles to Alexander the Great.

415. Sicilian expedition of Athenians under Alcibiades.

404. Death of Alcibiades.

404. Climax of painting under Zeuxis and Parrhastos. Death of Socrates.

374. Supremacy of Thebes.

359. Sculptor Praxiteles. Death of Demosthenes.

4. From alexander the Great to the destruction of Corinth.

336. Alexander, king of Macedonia.(Aristotle, Diogenes, the sculptor Lysippus, the painters Apelles and Protagenes.

334. Alexander in Asia.

327. Alexander's campaign toward India.

323. Beginning of the war of the Diadochides.

287-275. Philopömen, "the last of the Greeks."

146. Destruction of Corinth. Greece combined with Macedonia in a Roman province.

5. Greece under Roman and Byzantine rule, also under the Osmans.

86. Athens taken by Sulla.

117-138 A.D. Hadrian's buildings in Athens and other parts of Greece.

170. Pausanias issues his description of Greece.

260-268. Goths in Attica.

323-337. Constantine the Great. Victory of Christianity.

393. Olympic games cease.

395. Goths destroy Eleusis, enter Athens and lay waste the Peloponnessus.

467-477. Invasion of the Vandals.

529. School of Philosophy in Athens is closed.

746. Pestilence and extension of Slavic elements in Peloponnessus.
1204. Otho de la Roche, ruler of Athens.
1394. Rainiero Accajuoli, Duke of Athens.
1685-1699. Conquest of the Morea by the Venetians.
1687. On Sept. 26, about 7 P. M., destruction of the Parthenon by a shell directed by a Luneberg lieutenant under Königsmark and Morosini.

Grecian art and especially architecture, whose roots are to be sought in Assyria and Egypt, the two oldest civilized s states, exhibits in its monumental works the same structural principle as the buildings in the lands just mentioned.

Let it first be perceived in relation to the dwellings of t the poor of both countries, that as these were made of the materials, the clay layers of the great river bottom between the Euphrates and Tigris and of the sacred Nile stream, which nature freely offered to the primitive inhabitants, and which required the least care in preparation for building purposes. Of moulded bricks dried in the air, mixed with chopped straw or reeds, were formed the external walls, and the ceilings were of reeds and clay or of rough trunks of trees. Where wood for b building was obtained with difficulty, there appeared instead of the beam ceiling, the stone ceiling made of small natural stones or of bricks.[1]

1. See representations of such houses in "Nineve et Assyrie" by Victor Place. Pl. 41, after Layard, Pl. 17. Paris. 1867.

Want of a natural stone breaking into large pieces caused t the Assyrians to continue to use small materials even for their public buildings and in the construction of the vast royal palace, whereby they sought to give to their walls a greater resistance to injuries of the weather by facing them with burned and glazed bricks, and they employed asphaltum in setting the courses. It is to be ascribed to the defective nature of the building materials, that those colossal empires of the ancient world have left behind relatively so few vestiges of their activity in architecture. Rubbish heaps [2] a few yards in height conceal the lower courses of the city surrounded by walls in a rectangle (measuring 5906 × 5313 ft. in length and breadth) and

of the Palace of Khorsabad (completed 706 B.C.[3]), with the costly glazed tile facings of different colors, the colossal winged guardians at the entrance portals, with the bodies of bulls and the bearded human heads. Mighty arches and tunnel vaults of voussoirs, vaulted living rooms and sewers exhibit to us the matured system of a monumental covering of the apartments, where natural stone was lacking.

2. See Victor Place, Pl. 8, 9, 20 and others.

3. See Victor Place, Pl. 2.

The conditions were otherwise in the land of Egypt, where in addition to the beds of clay, soft and the hardest stones were at command for building purposes of every kind, and from which stone beams and slabs 29.53 ft. in length could be obtained a and employed for covering the halls of temples. [4] Walls were solid or furnished with windows and doorways, detached supports shaped as piers or columns, the protecting ceiling or roof -- these were the elements of architecture in the earliest period, that have remained the same until our time. Merely the external appearance experienced a change in time, but the nature remained the same.

See Denkmäler aus Egypten und Aethiopen by C. R. Lepsius. I. Abth. Pl. 78. Great Temple of Karnak. Blatt 1. Berlin.

In Egyptian stone construction attention is paid only to direct or relative resistance of the material, there being in safe construction only one force, the vertical pressure. [5]

5. See representation of the system in Perrot & Chipiez' L' Egypte, Vol. 1. Fig. 78.

It is otherwise in Assyrian masonry construction, in which on account of the pressure a side thrust occurs. The forces acting here are therefore of two kinds; pressure and thrust. For the stability of these buildings must be provided arrangements, that directly or indirectly neutralize the thrust. The noble simplicity of form and construction in the Egyptian style of architecture must in the Assyrian give place to a more complete system, which in consequence has become the one predominating in the world, by which the highest problems of architecture may be solved -- the spanning of the most colossal interiors without intermediate supports!

The same simple principles of architectural statics of the Egyptians, to whom moreover the conditions of vaulting by corbelling and also a rational vaulting with voussoirs were already known at an early date, as the vaults of the Ramesseum in Thebes show (see Lepsius, I, pl. 80; about 1200 B.C.), was followed by the Greeks in their monumental creations; the same nobility and simplicity in construction and the form required by it are expressed in them, and they continued faithful thereto, until the West and East Romans broke through them.

Columns, piers, solid walls and those with openings constructed with a batter and with doorway and window openings diminished at top, the horizontal stone beams and cornices, the ceiling of stone slabs (at least for the porticos), the support of the horizontal internal ceiling of the room by columns, the absence of all vaulting,-- these are and continue to be of Egyptian origin and form the ground principles of Grecian monumental architecture, while figures and ornamental forms were equally influenced by Egypt and Assyria!

Elements and conditions are the simplest conceivable and the "external form of the building perfectly expresses its structural idea. The Grecian temple architecture could be erected without artificial means of strengthening it, and it would endure."

Matters were otherwise with the introduction of the arch and vault as an esthetic movement in architecture. What Egypt left unconsidered, Assyria raised to a system, and we should designate and esteem this people as the first, that obtained results in the domain of the technics of vaulting. Aside from the simple tunnel vaults, it mastered the half dome and dome vaults, and perhaps already threw construction over square rooms.(Khorsabad ?). After them the Persians dared further attempts in this direction, and first by four trumpet vaults and spherical triangles created the transition from the square ground plan to the circular dome on the basis of the octagonal form with a span of 39.37 to 42.65 ft. for the dome.[1]

1. See M. Dieulafoy. L'Art Antique de la Perse. Part IV. Pl. V, XIV. Palaces of Firouzabad and Sarbistan -- about 550 B.C. Paris. 1885.

The same people (Sassanians) in the 6 th century A.D. afterwards excelled themselves by the construction of elliptical t tunnel vaults of 82.02 ft. span over the great halls of the r Royal Palace at Ctesiphon (of Chosroes). Tombs of great dimensions, constructed by corbelling, are shown to us by the Grecian mainland in the so-called treasuries, in those at Mycenae, Menidi, Orchomenos etc., of circular form in plan with the lines of a pointed vault in section. The Tomb of Atreus, still in good condition structurally, is with a span of 49.21 ft. a and also of considerable effect internally, and it remains an interesting structural work of the time of the Trojan war (somewhere before 1200 B.C.). A burial chamber constructed on the same principle, but of square plan and with but two walls connected bya vault, was discovered near Gnossos on Crete, designated as the royal Tomb Isopata (formerly Tomb of S. Idomeneos), which precedes in time the circular buildings mentioned.[1]

1. See Durm, J. Ueber vormykenische und Mykenische Architekturformen und der Kuppelgräber der milesichen Kolonie Pantikapaion im Jahrb.d. K.K. Oest. Arch. Inst. in Vienna. Vol. X. 1907. P. 41 et seq; p. 290 et seq.

In southern Russia -- near Kertch -- a similarly constructed tomb exhibits the attempt to construct the ceiling as a cloister vault by the corbelling out of the stone courses, and in another, the so-called royal Tumulus , is expressed the idea and the attempt is successful, to establish a steep conical dome over a square room by corbelled courses in spherical pendentives. According to the significance of the objects found, the buildings must be referred to the 6 th and 5 th centuries B.C.

At about the same time in Persia in a grander style and in the Crimea in small dimensions was carried out the same expedient, which about 1000 years later was brought into perfect form in S. Sophia at Constantinople. Intermediate steps might be made credible [2] in the allied and probably primitive structures of Syrian domed buildings, for example in Latakia and t the Church S. George at Ezra (515 A.D.), if the dates of these buildings were not ensured by inscriptions and a time of erection shown, that extends nearly to S. Sophia. The fame of having made the transition from the polygonal plan to the constr-

construction of the great domes on trumpets and pendentives remains to the Syrians and Byzantines without doubt. (Compare, for example, S. Vitale in Ravenna).[3]

2. M. de Vogue. La Syrie Centrale. P. 61. Paris. 1865.

3. A correct representation of the transition from the octagon to the dome was first given by Corrado Ricci in his book,-- "Ravenna. Collezione di Monografie illustrate. Series Ia. -- Italia artistica. Bergamo. 1903. P. 49. -- Secondo l'aspetto originario della cupola" -- which would be more intelligible by the addition of a horizontal section at the height of the transition. What is given concerning this in other earlier works is simply false, according to my examination on the spot!

Etruscans and Latins derived the theory from the Greeks. Syrian and Grecian architects performed good service for the Etruscans; Grecian architects, Anthemios of Tralles and Isidor of Miletus created the wonderful structure of the Church of S. Sophia with its low dome on spherical pendentives for a span of 98.43 ft. (6 th century; 532 A.D.). They were indeed surpassed by the tractable West Romans with their structures of the Pantheon dome(142.72 ft. span), of tunnel, cross and semidomical vaults, and the cloister and radial vaults of their baths and palaces.

But it was again the Greeks, who invented the vault constructed on the grandest scale in the Baths of Caracalla and of Diocletian, and indeed first executed in Pergamon and at the Odeion of Herodes Atticus in Athens, though on a smaller scale.

They were also Greeks, who omitted the opening for light at the vertex of the great dome (Pantheon), and instead of it arranged high side lights at the base of the dome. Greeks and Armenians extended and combined these two arrangements of high side and top lights by inserting above the pendentives the cylinder for admitting light and also crowned the vertex of the dome by a lantern for admitting light; a motive finally developed by the Italian Renaissance in a grand way on S. Peter's Cathedral at Rome.

They were also Syrians, who first permitted buttresses against arches and vaults to project internally or externally, while the West Romans still sought the solution in the unif-

uniform course of the walls. This also first became visible later (Minerva Medica) and in the completed manner with the addition of flying buttresses carried above the roof at the Basilica of Maxentius at Rome (330 A.D.), a splendid work of the period of Constantine, in contrast with which the 3-aisled basilican cathedrals, erected on the same principle, with their spans scarcely half as great and their complex system of f flying buttresses, make apparent the decadence from what simplicity, boldness of construction and internal effect demand.

Mediaeval undertakings in this domain thus clearly exhibit the principle, that we have placed for the Grecian temple:--"The building perfectly expresses its structural idea," even if it likewise does not as a structural work surpass allied works of the preceding time, at least not in the spans of the vaults. Even if the Gothic mediaeval style starts in direct opposition to the antique, both still have something in common; "the absolute nobility," that Zielinski [1] designates as the blossom of the antique seed, when he correctly remarks, that the structural principle in itself creates no architectural style; in this the ornamental principle always takes a greater or lesser part. And if architectural beauty is the perfect expression of the idea in pure form,[2] then they divide the prize; the Egyptian-Grecian and the Mediaeval-Gothic styles!

1. *Der Antike und wir. Lectures by Th. Zielinski, Professor at the University of S. Petersburg. Authorized translation by E. Schöler. P. 97. Leipzig. 1905.*

2. *F. Th. Vischer. Aesthetik oder Wissenschaft des Schönen. Stuttgart. 1858.*

In conclusion may yet be said a word concerning the new and much discussed harmony of architectural creations with the la landscape surrounding them! Such may be true in a very general way, yet not in detail. The building retains its character , once expressed, the landscapes alternates its own, puts on other attire, like the men occupying it in the course of time, and whose taste, sensibility and feeling likewise change.

Grecian temples, the great Roman public buildings for utility, the palaces and greater designs of the Italian Renaissance, the mediaeval cathedrals -- they stand yet in their old places, p

partly unchanged, also partly violated by the taste of the time.

But they have remained, while the landscape has changed, by which should be understood, not the nearest surroundings but the change in general. For example, has the view of the landscape remained the same in the South as in the North? -- No! The decrease of ancient culture, the products of a new world have altered it. The sunny and fruitful regions of Syria, of Palestine and Asia Minor are desolate, and there now begin to restore themselves the Roman colonies of north Africa, like t the blooming Timgad and many other places, the Campagna at Rome, splendidly adorned by villas and gardens in the imperial period and with forests interspresed, has become desolate or meadow, the fields around Paestum and Ephesus are swamps -- these are changes by neglect and destruction. A different effect is produced by what a new civilization has brought with itself. Thus America gave us the wild vine (Vitis Labrusca), that now overruns columns and walls with red color in autumn, it furnished the South with the opuntia fig (Opuntia Ficus Indica) and the aloe (Agave Americana), and in the most recent period, Australia supplied the eucalyptus tree [8] (Eucalyptus Globulus Labill or fever tree).

8. See Victor Hehn. Kulturpflanzen und Hausthiere. P. 448 et seq. Berlin. 1874.

Opuntias and aloes characterize or enhance, as Victor Hehn expresses it, "the type of mediterranean landscape, that for a long time has received from the East its strong and quiet coloring." The lofty eucalyptus with its grotesque outlines, in smaller and more extensive groups, also planted along roads, has materially changed the appearance of the landscapes in central and southern Italy.

Have the buildings of the ancient world, restricted to oaks, sycamores and pines, become less attractive to us by the addition of these new cultivated plants, that have won a certain predominance and have indeed become characteristic in the southern landscape? Do they lessen or heighten the effect of the now wooded mountain slopes, only slowly recovering from their baldness?

The peripteral structure with flat roof was succeeded without scruple in the same landscape by domed buildings, and these a-

again by the long basilicas without objection or pious wishes and assertions, that all artistic effect must be based upon the contrary, and that the pine only harmonized with the flat roof and the cypress with the dome, or the reverse, if harmony of forms were required.

The so-called architecture of the soil, justified by age alone, has never become supreme, God be praised, for we should now have remained on the standpoint of the lake-dwellers or of the cave men. And when men give out as such the creations of the Biedermeier period in the German empire or the Black Forest, Swiss or Tyrolese buildings, they are indeed in error and thus forget, that the first saw the light of the world about 80 years since, and that the latter are scarcely three hundred years old in their present form, that we do not know what preceded them, and that the landscape surroundings have not remained the same.

Unsuitable and intolerable finally became merely the vagaries of the unstructural styles. Still only the living is right, and every movement to arouse improvement in art is to be welcomed, even if it at first pursues a wrong path; men should then not forget, "the style only originates by structural principles and the consistent development of similar ornamental forms," and that in the denial of all style -- capriciousness, fanciful or abstruse also appear among the creations of architecture. What is required now corresponds neither to innate truth nor nobility, not even to suitability in most cases, nor does it accord with the constantly changing landscape. To learn to recognize the innate truth and nobleness in Grecian works in general and details is now our problem. First meditate, then commence, but one must first know something!

From the fever for restoring buildings, whose purpose had vanished, the Greeks were relieved by a happy fate; they do not fall under the condemnation of John Ruskin:-- "Restoration is a lie, from beginning to end"!

The adjacent synopsis and Plate 1 serve for a rapid orientation of the work and point out the way by which the important principles of construction have spread from the two centres of mentioned, over the wide earth.

Systematic representation of the course of architectural development among the different civilized peoples with reference to the monumental treatment of ceilings.

ASSYRIANS. EGYPTIANS.

The system of corbelling out horizontal courses to form inclined or curved lines was known to both nations and was employed by both.

ASSYRIANS.

Vaulted ceilings; semicircular and pointed tunnel vaults of voussoirs for buildings of utility and galleries of tombs.

Sewers, galleries in Mugheir, the latter constructed by corbelling.

Niches and dome vaults over square rooms in the Palace at Khorsabad (probably pendentives) 706 B.C.

Dwellings with high and low domes represented on reliefs. (See Layard).

PERSIANS:- Domes of voussoirs over square rooms up to 39.37 ft. span with trumpets (conical vaults and spherical pendentives in Firouzabad and Sarbistan 550 B.C. (According to M. Dieulafoy).

SASSANIAN period:- Tunnel vaults of elliptical form up to 82.02 ft. span. Palace of Ctesiphon in 6 th century A.D.

Further extension in Asia:- India, China and Japan to America.

In the former countries chief-

EGYPTIANS.

Horizontal ceilings of stone beams and slabs, for tombs and buildings of utility.

Tunnel vaults of semicircular and pointed form. Vaulted passages-tunnel vaults with radial jointing - for the tomb chambers of the 3 d and 6 th dynasties. In Rekaknah (according to Garstang) such a one from the time before 3122 B.C. Elliptical tunnel vaults 1200 B.C.(13.12 ft. spanat the Ramesseum).

Domes over circular rooms con- of rings of bricks in pointed-arched form in Abydos. Semicircular arches constructed by corbelling in Abydos and Deir-el-Bahri. Covering by stone struts in the great pyramids and tombs in Gizeh.

GREEKS:- Premycenean and Mycenean period. Tunnel vaults by corbelling. Royal Tomb Isopata near Cnossos on Crete. Era of Minos 1800 B.C. Domed tombs by corbelling out in form of pointed arch in Mycenae, Orchomenos, Menidi etc., up to 49.21 ft. internal diameter. Period bef-

chiefly wooden ceilings; bricks and lime mortar known 300 B.C. Central America; Peru, Mexico, Yucatan. Polygonal masonry, corbelling with stones and lime mortar are known. Highest period 10 th century A.D.

PHOENICIANS as transmitters. Conical round buildings with corbelling of horizontal courses.

Gigantea at Gozzo; Hagiar Kim, the Nurhags.

ETRUSCANS AND LATINS:- Corbellings and voussoir vaults for the tombs and buildings of utility.(Bridges).

...before the Trojan war(1400-1200 B.C.). Bricks and lime mortar at the buildings at Gournaia on Crete(18 th Century B.C.).

PHRYGIA:- Tomb of Tantalus, pointed tunnel vault by corbelling.

LYDIA AND CARIA:- Semicircular pointed tunnel vaults constructed by corbelling in Tumulus Eneresi; another of pointed form at Elsfarlik.

PANTIKPAON:- Cloister vaults by corbelling; domes over square rooms above spherical pendentives constructed by corbelling. (6 th and 5 th century B.C.). Lime mortar.

LYCIA:- Squared transverse beams support the ceiling beams of round timbers set close together.

The ceilings of round logs imitated by Tomb II in Mycenae. Mode of construction of beam ceilings in most ancient time.

OLDEST GRECIAN TEMPLE:- Wooden ceilings of portico and of cell; covering of beams by terra cotta slabs and cases. Free supports of wood and of stone. Porous limestone covered by plastering.

BEST PERIOD:- Stone ceilings of the porticos composed of marble beams and slabs (coffered ceiling). Retention of wooden coffered ceiling over the cell.

Stone supports exclusively, light crystalline limestone being the preferred structural material.

ALEXANDRIAN PERIOD:- As in the best period, wooden and stone ceilings.

First cross vaults of ashlars in Pergamon and in Athens(Odeon).

ETRUSCANS, LATINS AND GREEKS ABANDON THE PRELIMINARY STEPS:- The horizontal wooden and stone ceilings are supplanted by vaulted ceilings. Contest of the architrave and arch in architecture. First combination of the two. Victory of the vaulted monumental ceiling of cut stone, bricks and concrete.

WEST ROMANS:- Horizontal ceilings of stone slabs (Temples of Vesta, i.e., round temples in Rome, Tivoli etc. Amphitheatre in Arles). Tunnel, cross, modical and niche vaults with smooth or coffered interiors, with and without intersecting compartments, inclined vaults, annular vaults, straight arches, cloister vaults, domes over circular and polygonal rooms, radial v vaults, conical vaults, domes with openings at vertex and high side lights (Pantheon and the Rotunda of Caracalla), construction by rings of masonry (Treves, Pont-du-Gard), transition f from polygonal outer walls to domes by corbelling the courses. Division of the vaults into supporting ribs and filling compartments, while the ribs lie in the surface of the vault. Appearance of projecting buttresses (Minerva medica) and abutment p piers against vaults (plans of the Baths and of Basilica Maximus). Great construction of tunnel, cross vaults and domes, (82.02-95.15-142.72 ft. spans). Great interiors and monumental execution. Ceiling and roof coincide. As forms of arches and vaults appear, the straight, segmental and semicircular, the pointed arch, stilted arch, horseshoe arch, arch of double curvature.(Semicircular arch in cylindrical wall).

EAST ROMANS:- To the acquisitions of the West Romans may be added; the melon vault, the dome with projecting ribs, the subdivision into supporting and filling parts plainly indicated, buttresses in Syria and Byzantium, Syrian ceilings of stone slabs on supporting arches, transition to the dome over a squ-

square room by trumpets and pendentives. Spherical pendentives for the great structure of S. Sophia (98.43 ft. span). High side light at base of dome, rejection and resumption of the vertex lighting. High side light further by the insertion of a drum between the ring over the pendentives and the circular dome, loading the vertex of the latter by a lantern admitting light. Pots as a vaulting material (S. Vitale in Ravenna). Buttresses of vast dimensions at S. Sophia.

EARLY CHRISTIAN, ROMANESQUE AND GOTHIC PERIOD:- From the ruins and prototypes of the architecture of the South and the East are developed in the West the Early Christian, the Romanesque and the Gothic styles of architecture. The vaulted ceiling of the interior retains its supremacy, the system, latent in the antique, of subdivided and architectural masses into bearing or supporting, filling or covering parts, plainly appears, the semicircular arch must give way to the pointed arch, first for structural reasons, then as a form expression of new style; the concealed Roman ribs appear on the vaults, strongly dividing the surfaces (ribs and star vaults). The boldness of the antique vaulting is thus lost, their spans are no longer attained, yet the structural movement actually predominates. This conventional innovation has relatively the shortest duration.

The antique, with its simple and grand principles and its unassuming beauty , again breaks through and matures in the:-

RENAISSANCE IN ITALY, FRANCE AND GERMANY:- That becomes a world architecture. Its highest triumph in the domain of church architecture remains in Italy, besides the Florentine Cathedral being S. Peter's Basilica in Rome. "It places the Pantheon on columns," and it introduces into architecture in the m most monumental way, the double dome with the lantern above a drum admitting light. In France, it produced the Church of Invalids, Church of Val de Grace etc., where the wooden dome replaces the stone external dome, which makes possible a more elegant development in height on the exterior with lower proportions in the interior. In England, it creates the masterwork of Christopher Wren -- the Church of S. Paul!

Will the grandchildren succeed in adding new things to all,

which the civilization of the nations has produced during 6000 years? Perhaps, but not with the rapidity of a storm! The c cry, "Woe, that you are a grandchild," should not destroy our courage. The antique will show itself as a guide in a new change of affairs, as it has formerly done.

The little map shows the ancient routes and the capitals of the world.(Plate 1). From what capitals will the new be derived?

II. THE EARLIEST STONE STRUCTURES; WALLS, CITY GATES, PALACES OF RULERS AND ROYAL TOMBS.

The stone structures to be regarded as the oldest on Grecian soil are the massive walls of Tiryns, Mycenae and Argos, the first of these being probably already built 12 centuries B.C. and ruined by the Argives about 468 B.C.. We find similar walls in Asia Minor at Kalynda and Iassos in Caria, partly laid in regular, partly in random courses, also on Cyprus, Rhodes, Crete, in the delta of the Nile, and in southern Italy. Who constructed them? Were they members or workmen of a certain race, whose home became too crowded, and seeking new dwelling places or employment, they took their way over the coasts of Asia Minor toward Europe, leaving behind them these vestiges of their industry?

Or are these similarly constructed walls in the localities mentioned independent of each other, similar results of like conditions, produced by nations building in stone?

Yet similar walls are also found in China and in the table lands of Peru. Cuzco, 12,858 ft. above the sea (capital of t the Inca kingdom and conquered by the Spaniards in 1533), exhibits considerable remains thereof; these are the ruins of a great Temple of the Sun (Ynti), on whose site now stands a monastery, and the ancient Palace of the Incas. We are here amazed by the accurate jointing of the very large blocks of granite and porphyry of irregular forms and laid without mortar. The fortifications of the neighboring Cerro (Ollantay Tambo) are also wonderful, the exquisitely wrought stones of which must have been transported across the river from the quarry 2 leagues distant. The stone walls are composed of blocks of hard granite, up to 7.65 ft. wide, 12.3 ft. long and 6.56 ft. or more in thickness. Colossal slabs of stone with reentrant polygonal angles alternate in the lower portion of the wall with the smaller intermediate polygonal blocks, while materials of more nearly equal dimensions are employed above these.

But the walls are not merely constructed similarly; their openings have the same form as in Egypt, western Asia and Greece, the upright trapezoidal form of doorway diminished up-

upwards. In some cases, the so-called "ears" are even clearly indicated; the pyramidal batter of the wall and the decoration of the doorway by sacred animal figures in relief are also to be found.

One step further:- If we consider the objects of art industry found in Peruvian tombs, we there find ornaments and patterns, whose affinities in form with Egyptian, Asian and Grecian motives cannot be denied. The chess-board pattern, the fret, etc., occur in a perfectly developed state on textile fabrics and tapestries. The combination of colors thereon is generally happy; fringes of thin cords are found, as well as tassels of wool and cotton, and borders of small pieces of mother-of-pearl or of gayly colored feathers are sewed on the edge of t the fabric, upon which thin plates of gold or silver are frequently sewn,-- embroidery work as found on the very ancient Assyrian garments. Engravings on copper weapons very distinctly represent the waves of the sea, that characteristic Egyptian and Grecian decoration!

Also on Chinese pottery of ancient times and on Mexican pottery (now in the British Museum) are found ornaments, that possess striking resemblances to the Grecian; the fret pattern from Yucatan leaves nothing to be desired in perfection of form in comparison with the Grecian, even as little as the Mexican sea wave pattern and also the recurved ovate leaf.(Fig. 6).

In the New World, the centres of civilization are on the high table lands of Peru, Cundimarca and Mexico, but in the Old World are always in a level country!-- Does there exist a connection between these works of the Old and New Worlds! So much is certain, that when Europeans became acquainted with America,t the so-called copper colored and peculiarly characteristic American existed there; did he belong to an Asian race, that had immigrated in indefinate primitive ages? The assumption is not improbable. The structures in central America have an East Indian taste. Their architects were acquainted with lime mortar, polygonal masonry, and the principle of corbelling out to cover openings; the arch was unknown to them, on the other hand, as well as iron and its use for working tools. And yet we must not date the architectural works in Peru, Mexico and Yucatan

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back beyond the 10 th century A.D. The seals are not yet broken; everywhere the same needs may have produced the like Ideas; a desire to conclude that certain similar monuments in different parts of the world are due to the same authors is at least deceptive.

The same idea is expressed by Virchow in his preface to Schliemann's Ilios:- "But experience has taught us how uncertain are archaeological "guiding muscles." The human mind finds in different localities the same things and in the same place different things. In the same period are developed certain artistic or technical forms without any connection between the artists or workmen."

The Phoenicians were already settled on the coast of Syria in 2000 B.C., and they transported the developed civilization of Egypt and of Babylonia to all the shores of the Mediterranean Sea; acquisitiveness led this mobile Semetic race to Great Britain and India. Its proud cities have disappeared from the earth; but vestiges of their activity in building are preserved for us in the noble ashlar walls on the island of Arvad and near Marathus; remains of temples on Malta, Gozzo, and at Amrith are further evidences thereof, as well as the massive substructures on the shore and in the citadel of Carthage, and in the retaining walls of the Temple of Solomon, constructed about 1014 B.C. The wall with closely fitting joints is built of great blocks, moderately bonded; these blocks have drafted margins with rough projecting faces. (Fig. 7).

Similar characteristics are found in the old walls on the Argolic gulf; Euripides says that these were in accordance with Phoenician rules of building. The Phoenicians and Carians are named as the earlier inhabitants of the Greek islands. The l latter were often intimately connected with the Hyksos, who ruled in Egypt, and they settled o n the Greek islands after being expelled from Egypt. Mention is made of the immigration of Phoenician and Egyptian colonists into Greece. Pelasgians also make their appearance; they are now barbarians, now ancestors of the Hellenes, then a Hellenic race. We will not linger in the foggy and dangerous path of ethnographic research; I conform to Schliemann's opinion, that the name Pelasgian was

originally the designation of some one of the many races, that formerly inhabited Greece, and that this name was later employed as the most general appellation of all prehellenic races, without regard to its true ethnographic relations. But the Hellenes, which we thus oppose to the Pelasgians, were doubtless nothing more than a single member of the series of allied races comprised under the common name of "Pelasgians."

This masonry is termed Pelasgian and also Cyclopean. Semper terms it polygonal masonry.

We find the walls here considered to be constructed of irregular blocks with spalls in the interstices of the joints, or of carefully wrought polygonal blocks; others consist of horizontal courses of stones , whose end joints are not always vertical, and whose bed joints frequently encroach on other courses.

Common to the Cyclopean and polygonal masonry are great differences in the dimensions of the stones in using hard materials.

The former is constructed of great limestone blocks, only cut on the bed and joint surfaces, which are chinked with small stone spalls and strengthened by clay mortar, laid up in courses without any batter. Differing from this is the polygonal masonry of irregular stones, carefully dressed on all beds, joints and visible surfaces, with close jointing. It is later than the Cyclopean and extends down into the historical period. The setting in courses occurs without the aid of any mortar.

In connection with polygonal masonry also occurs isodomic masonry, built of regular prismatic stones in horizontal courses, where the beds and joints meet at right, acute or obtuse angles. This also frequently occurs merely as a horizontal course for leveling up polygonal masonry. Pure and mixed polygonal masonry belongs to the same period.

What was the purpose of these gigantic walls? Among the Phoenicians, they served as dykes and quays, as protecting walls, and as substructures of temples; in Argolis, they were bulwarks for offense and defense, the beginning of a civic commonwealth. Accordingly as each man readily abandoned his dwelling place in earlier times, when compelled by a stronger man,

since there was no commerce nor rational agriculture in Greece and no wealth to be acquired, but merely existence to be prolonged, yet circumstances were changed, when men strove for money, fortune and profit. Acquisitions must be secured, protected and defended from mankind, to whom gains won quickly, boldly and without toil were preferable to those earned by the industry and labor of the hands; defended against robbery, a vocation conferring fame and not disgrace. The possessors gathered together; the poorer entered the service of the richer; the strongest led and ruled the originally small corporate body. Mining and defense took place behind the walls mentioned, and these circumstances thus gave occasion for strong dwelling places enclosed by walls. Thucydides places the oldest cities far from the sea, those founded later being close to it, the former protected by their natural situation, the latter by the walls.

Thus may conditions probably have been in Greece at the time of the Trojan war (1194-1184 B.C.), the first common and politically important undertaking of the Hellenic race.

The lower circular walls of Tiryns, whose materials were taken from a stone quarry about a half hour distant from the city (see what was said of settlements), belong by their construction to the most primitive masonry.

The stones are of the most varied sizes, just as they came from the quarry, without any further work on the end, bed or face surfaces, and they are laid in courses without any cementing material; the interstices produced by the courses are filled with small stone spalls, also set dry. The larger blocks measure 4.92 to 6.56 ft. long and up to 3.28 ft. high (Fig. 8). The walls must originally have had a height of 59 ft. in some places.

The casemate-like galleries and their vaulting within these walls are unique. Their clear width averages 6.5 ft. (ekact measures are impossible in consequence of the rough and uncut surfaces of the stone; Figs. 9, 10), with a height of about 9.84 ft. The walls are composed of three vertical courses, t the ceiling is of corbelled courses of ashlars bonded together at top, meeting capriciously and inaccurately, after the accidental form of the stones. With the rude shapes of the

stones, this kind of vaulting can as little be termed pointed-arched, as can the triangular openings in the external wall of the gallery, also formed by corbelling and extending down to the ground. Similar wall openings are found in the regularly coursed walls of the ancient structures near Missolonghi.

Polygonal walls of the perfected style and with the greatest care in execution, coursed with ashlars, are found on the slopes of the steepand bare rock, on which stands the citadel of Larissa, the former fortress of Argos; they terminate a series of ancient monuments, which extends in the vicinity of the present city. The material is a limestone, now shining with a fine cool gray and glowing with warm tints in other places, t that comes from the immediate vicinity. The faces of the larger blocks are 3.81 ft. by 4.27 ft to 5.91 ft., with neatly projecting faces free from irregularities and unevennesses; the faces gently curve at the edges, which are dressed with great exactness, showing the very close contact of the stones in the well preserved portions. Mortar is also not employed here. The indenting of one stone into another is frequently quite artificial; the external surfaces of the ashlars are irregular pentagons, hexagons or heptagons. The lower corner-stone of the wall bears on its outer surface a nearly unrecognizable low relief (a sitting figure about 1.18 ft. high), above which is an obliterated inscription.(Fig.11).

J. Braun and G. Semper desire to recognize the latent principle of the arch in this irregular network of ashlars subject to tension and compression. The blocks do not rest on each o-other as in walls of ashlars in horizontal courses; they actually form arches under compression on account of their peculiar arrangement. I may question whether this was the reason for the complicated jointing; the peculiar forms of the materials probably supplied the leading motive therefor. The limestone ashlars or breccia-like stones, of which most polygonal walls are constructed, always have a short conchoidal fracture, and the roughly broken ashlars always have a rounded face, which is most readily and economically dressed with short sides. Materials in strata and breaking into regular blocks is never used for polygonal masonry; compare the retaining

walls of Jerusalem, built of ashlars from the Lebanon.(Fig.7).

Viollet-le-Duc believes these polygonal walls to result from the accidental forms of the quarried stones or boulders; therefore the broadest stones are placed at the bottom in the first course on the ground; the angle between the stones already set is measured by a bevel, and a stone with about the same angle is sought and fitted there; the same process is followed for the succeeding courses. (Fig. 12).

Mycenae, lying near Argos, again exhibits Cyclopean masonry. The finest remains exist in the side walls of the so-called Treasury of Atreus and in those of the Gate of the Lions, which forms the entrance to the acropolis. The stone quarry is here also in the immediate vicinity; the material being supplied by the slopes of the double-peaked Mount Euboa, 2297 ft. high, which surrounds the Argolic amphitheatre. The blocks a are laid in courses, neither exactly horizontal nor quite parallel, the end joints not being always vertical, and no mortar is used. The faces of the ashlars are parallelograms or trapezoids; the external surfaces are made tolerably even, so far as permitted by the nature of the material; the stones are somewhat curved toward the edges, so that the joints do not exactly fit. The end joints in the side walls at the Gate of Lions are not arranged in structurally correct bond is often asserted, but this is incorrect. (Fig. 15 [1]). The ratio of height to length varies from 1 : 2 to 1 : 3, or 1 : 4 and 1 : 5. The lintel of the doorway is one of the largest wrought stones ever used in architecture. The stability of this masonry chiefly depends on the use of the largest blocks possible, besides the bonded coursing, together with their weight.

The lintel of the Gate of Lions is 14.76 ft. long, 7.87 ft. wide and 3.67 ft. high at the middle, the upper side being convex, its opening being diminished some 0.74 to 0.75 ft. upward, and with a clear span of 9.85 or 9.52 ft. It is not loaded by the masonry above it, but the originally 5 courses are corbelled out to relieve it. The resulting triangular opening is again closed by a slab 9.84 ft. high, 11.93 ft. wide at bottom and 2.00 ft. thick, that bears the oldest monumental sculpture in Greece. (Fig. 13 [1]). The relief slab mentioned shows

two bases placed very near each other and covered by a common stone (Schliemann believes this to be an altar); from this rises a column in the central line of the triangle, whose base is formed by a slightly projecting fillet, its shaft being much injured on the left side and being connected with the capital by a cove. By this and the heavy-headed capital twice stepped moulding or bell shape and a crowning abacus, the column seems diminished extremely little downward. I say "seems", since the outline on the right of the central axis is set vertical, and that on the left of the axis is made uncertain by injuries and weather. After repeated visits to the original on the spot, I am unable to recognize any increase in the diameter of the shaft of the stele, to the extent usually given by statement and illustration. This stele already in our time has suffered many paper squeezes and rubbings. That steles, table and chair legs, even from the most ancient times, were made thinner below that above, is well known and is the same today. Accordingly if we retain the idea of a "stele" for the work, an enlargement of the support upwards did not attract a attention. On the other hand, if we regard it as a cast of a complete column in the architectural sense, then according to the date of origin, such a caprice would not further cause notice by the wise. It had its embodiment in the columns of the promenade hall at Karnak of the time of the 18 th dynasty. (Thothmes. 1597-1447 B.C.). The shafts are there but slightly enlarged upwards, a procedure that has received little consideration.

1. Fig. 14 is from a photograph of the original in place a and shows the present condition of the surface of the stone. Compare this with the plaster cast in the Berlin Museum, whose imperfections have already produced so much confusion, and unfortunately later found acceptance in the splendid work of Perrot and Chipiez.

The bloom of Mycenean civilization falls in the period from 1900-1200 B.C. according to some, but according to others in the years from 1500-1200, thus in any case before the Trojan war. Asians and Egyptians were then well known. This acquaintance could also be expressed in architecture, if not in the

form of the capital, yet in that of the shaft of the column. The Egyptian prototype -- a stone column 20.81 ft. high and increased in diameter about 3.54 ins. at top -- exists unique in the architectural history of the ancient world. The shaft reversed and the capital distorted -- but it was done once and we must consider it. Lepsius first determined it, and Perrot and Chipiez enlarged upon this abnormal column, without seeking any relations with the stele at Mycenae. That a known preference for the form might exist, has indeed been admitted by J.H.Middleton [1] in the attempt to test the question on the object itself. He says:- "My own measurements make the column about 1 1/4 ins. wider at the top than at the bottom, but the work is too rough for any minute exactness of measurement," and he thus determines under the assumption a difference of 1 1/4 ins. between the upper and lower diameters of the shaft for a height of 5.71 ft. for the stele, especially emphasizing that the condition of the sculpture no longer permits accurate measurements. I agree in this with Middleton. Fig. 18 represents on the basis of the statements mentioned my examination by the aid of a large photograph, and what can be determined, but which does not agree with what the cast in the P Berlin Museum best gives. Middleton does not state how and at what parts of the shaft he measured, that indeed seemed unnecessary to him in the condition of the sculpture as described. I estimate the difference as measured too large, that if he in general intended to keep at best within the limits of the perverse Egyptian column, and a difference of 0.98 instead of 1 1/4 may have resulted.

1. *Journal of Hellenic Studies. Vol. 7. P. 163. Note 1. London. 1886.*

On the abacus lie four rolls or round sticks, appearing on the front as imperfect round disks, as they were similarly to be found on Lycian tombs, above them being a square slab. Also on the covering above the lintel of the doorway of the nearly adjacent Tomb in Mycenae are they executed, and then again on a small clay object (little altar) at Cnossos [1]), certainly not free from objections, in regard to which a doubt is expressed concerning the required form of the supporting little column.

1. See J. Durm in Jahrb. des K.K.Oest. Arch. Inst. Ueber vormykenische und Mykenische Architekturformen. Vol. 10. P. 41 et seq. Vienna. 1907.

These disks are given differently in new publications (see Athen. Mitth. des K.D. Arch. Inst, 1879) as octagonal instead of round, which I was unable to establish as a correction -- the various statements may be referred to the inaccuracy of the original in execution. A fragment of a frieze from Mycenae in gray marble and belonging to the "Elgin collection," 1.48 ft. high and now exhibited in the British Museum, permits the occurrence to be clearly recognized. The disks are there sometimes round and sometimes polygonal in form, according to the quality of the work. The fragment is placed at the height of the eye and can therefore be accurately observed. On a "Lycian" fragment of a cornice to be found there are the ends of the round sticks chiefly circular, but the outer ones are oval! Facing the column are two animal forms with their fore-feet r resting on the pedestal, designated as lions by Pausanias. T Their heads as well as the apex of the triangular sculptured slab exist no longer. The peculiar fractured surfaces and the holes for metal pins at the necks show, that the heads were not wrought in the same piece as the slab, but were added; the small free space on the slab beside the places where attached show, that they looked outward from the sculptured slab. They need not have been of metal, on account of the facts described, and when it was elsewhere said:- "The animals look down on th those entering," although they no longer have heads, and this is again a statement without reflection! The muscles and the soft forms of the bodies as well as the treatment of the tails without tufts recall an Assyrian conception and style of handling. [1] These are also recalled by the entire composition, in which this heraldic ornamentation recurs, and because early Grecian art certainly was much under oriental influences. [2] "The animals grouped in a pair, and which are symmetrically opposed to each other on both sides of a separating medium," may serve as proof of the principle:-"that symmetry shows itself even as a requirement for all decorative art creations, innate in mankind from the beginning, that the Chinese knew

this just as well as the ancient Egyptians -- and that it was likewise in use 1000 years before the origin of Assyrian royal palaces." F. Adler [3] recognizes in the column and with its ceiling of round sticks the art symbol of the royal house, the lions being its guardians, and before the royal hall stood the stone double throne. The royal house and the royal throne were under divine protection."

1. See the allied Phrygian monuments, the ivory handle from Menidi and the island stones of Crete and of Rhodes. Jour. of Hellenic Studies. Vol. 3. Pls. 17, 18.

2. See A Riegl. Stilfragen. Grundlegen zu einer Geschichte der Ornamentik. P. 38-40. II. Der Wappenstil. Berlin. 1898.

3. Dr. F. Adler. Zur Kunstgeschichte. Vortra"ge, Abhandlungen und Festreden. Berlin. 1906.

On the scientific side is stated in K. Baedeker (p.328 of edition of 1904):- "A passage 32.51 ft. wide and 49.21 ft. long leads to the main entrance, the famous Gate of Lions. The walls on the right and left, the former strengthened like a tower, exhibit in a singular way the vertical end joints of t the blocks over each other, instead of the upper stones covering the lower ones." By repeated observation on Easter Sunday in 1906, I ascertained that on the left of the entrance, the solid rock is included and is dressed for several yards high in the side wall, and that the colossal ashlars only begin above this; further, that on the right side the ashlars rest directly on the ground, and that the view shown in Fig. 15, according to which no vestige of the "peculiar" position of the end joints appears, rather exhibits a very good bonded jointing. The former statement is therefore based on an error.[1]

1. Not to criticise all the corrections made, but rather with reference to Riegl's words:- "It is still the fate of man to only reach truth through error").

Of especial interest is the Phoenician masonry of the Temple at Hagiar Kim, about 4 1/2 miles south of the village of Krendi on Malta. Enormous slabs of stone set upright first enclose a semicircle, above which commences the horizontally coursed masonry of great oblong blocks, an arrangement retained in principle in the cell wall of the Grecian temples of the best per-

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period. The Temple of Poseidon at Paestum, the Temple of Zeus at Olympia, the Parthenon, the Theseion, the Erectheion etc., have first above the ground the space-enclosing stones set on edge, above this being only the bonded and coursed regular masonry. (Fig. 17).

In the Temple of Melkart, the masonry of large stones is again composed of irregular blocks, one set on another, only restricted by the dimensions of the blocks; no cementing material is used anywhere between the separate stones.

These ancient stone monuments of Phoenician and Pelasgian origin are so grand and mighty, that one may perceive and be astonished at their expression of an architectural formative power, though rudely acting, although they were equalled and frequently excelled in expression during the Renaissance period by the gigantic palaces cf the Florentine nobility. Ashlars 28.24 ft. long, as in the Pitti Palace, with bosses projecting 2.95 to 3.26 ft., as in the masonry of the terrace of the same palace, were not often found, or excelled in antiquity.

Another kind of masonry requires mention, the so-called Dryopic masonry existing in the remains of ancient buildings on Euboa. Its peculiarity is due to the nature of the materials. Long slabs, breakink proportionally thin and left rough on all sides, as quarried, are laid on each other without mortar in courses, leveled up,and the joints are filled with small stones. The walls therefore have a thickness of at least 6.56 ft.

For the walls of sun-dried bricks mentioned by Pausanias, m manifest evidence has been found since the discoveries in the masses of ruins at Hissarlik.

The bricks are bonded in courses, the masonry is strengthened by wooden anchors built in, and are constructed as in Fig. 18. The unburnt bricks are made of clay mixed with chopped straw, and they have a thickness of 3.9 to 5.9 ins., with a length up to 25.6 ins., while the clay joints are from 0.39 to 1.18 ins. thick. The surface of the wall is frequently covered by a thin wash of white clay (like pipeclay). [1]

1. See Durm, J. Zum Kampf um Troja. Berlin. 1890. Reprint from Cent. d. Bauverw. 1890.

Bricks - burned - of reddish-yellow clay were found in the

buildings in Gournia on Crete, some examples of which in two sizes are now preserved in the Museum at Candia. They were mentioned in the report of finds by Miss Harriet A. Boyd and are the referred to the bronze period -- 1100 B.C. [2]

2. See American Jour. of Archaeol. Society's excavations at Gournia, Crete, 1901-1903 by Harriet A. Boyd. Vol. 1. No. 1. P. 18. London. Bronze age 1100 B.C., and Note 1 there, where o one brick is designated as measuring 13.58 ins. long by 9.25 ins. wide by 8.15 ins. thick, and as "hard,-firm ---certainly fire baked." -- I have satisfied myself concerning the latter peculiarity of the bricks, and my measurements of the two bricks differ but little from those given.(Fig. 19).

The bricks in the Museum bear traces of a bedding in clay and a white mortar. The chemical examination by Privy Councillor Dr. Engler in Carlsruhe gave the following result for the latter:- "The mortar chiefly consists of carbonate of lime and sand with the addition of some clay (loam ?) without the slightest mixture of Gypsum, for which I made another test afterwards. Accordingly it is ordinary lime mortar. From the rounded grains of sand, I might deduce the use of sea sand in the preparation of the mortar." (Carlsruhe. June 2. 1906). If the bricks are correctly dated by Miss H. A. Boyd, then must the use of lime mortar be also dated farther back.(Egypt was already acquainted with it earlier. Lime mortar in the pyramids in connection with split stones and bricks).

Palaces of rulers, citadels, dwellings of powerful individuals, strongholds for the safe keeping of acquired wealth and the preservation of ornaments and treasures, monumental sepulchres of rulers, memorials for posterity, all these remains of buildings are of architectural importance.

We indeed heretofore only knew of the former by the Homeric poems, from which we must conceive the palaces of the rulers to have been somewhat finer, than would be supposed from the defiant and rude fortress walls, if Thucydides be not mistaken, when he says (of course in reference to another point), "It should be understood that Homer, as a poet, exaggerates the greatness and beauty of things."

According to him, the Palace of Menelaus in Sparta gleamed

with bronze, silver, gold, amber and ivory; walls plated with bronze, leaves and jambs of doors overlaid with plates of gold and silver, are found in the Palace of Alkinous.

Among others, Homer also calls Mycenai the "rich in gold"; Thucydides mentions the great treasures of Pelops, brought from Asia by him, and that made possible his power and the assignment of his name to this portion of the country; his descendants, the Pelopides Atreus and Agamemnon, should be regarded as "augmentors" of the possessions of the family until the breaking out of the Trojan war.

The Homeric descriptions were succeeded by the results of t the excavations in the citadel of Tiryns,[1] at Mycenae, and at Troja, which are aided by our presentation of the palace of a ruler, even if this be merely based on a ground plan. The latter (Fig. 20) exhibits the arrangement of the walls of the upper citadel, as it appeared with its massive fortifications on the isolated hill-top, rising from the plain. The ashlars of these are limestone blocks, roughly or more smoothly dressed, frequently set in horizontal courses, and set without mortar, as commonly done in antiquity, which would have had but a limited value in thin layers with the dimensions of the blocks.[2] In the course of time, the joints and cavities have become filled with dust and clayey earth, which has suggested the use of clay mortar, but which would indeed have been no better than ordinary lime mortar.[3]

1. See Schliemann. Tiryns. Die prähistorische Palast der Könige von Tiryns etc. Leipzig. 1886.

Borrmann, R. Die Burg von Tiryns. Cent. d. Bauverw. 1886.P.89.

Schuchardt, C. Schliemann's Ausgrabungen in Troja, Tiryns, Mykenä, orchomenos, Ithaka im Lichte der heutigen Wissenschaft. Leipzig. 1890.

2. Stone blocks on the tower are 3.28 ft. high and up to 13.12 ft long.

3. See Schuchardt, C. Same, p. 40.

The assumption that the water channels were likewise set with clay mortar is evidently to be rejected. [4]

Thin coatings of lime paste on the beds are shown by the domed Tombs of Pantikapaeon. See Durm, J. Die Kuppelgräber der

milesischen Kolonie Pantikapaon in the Jahrb. d. K. K. Oest. Arch. Inst. Vol. 10. P. 230. Vienna. 1907. -- Also see the brick buildings at Gournia on Crete. 1100. B.C.

The ground plan of the Palace [1] is explained by the discoverers, Schliemann and Dörpfeld, as follows, and this explanation may be the less readily attacked, since the statements agree with the reality in all points, of which I am convinced by an observation at the place -- the last being in April, 1906.

1. *Fig. 20 is a facsimile reproduction from Cent d. Bauverw. 1886. P. 91.*

"As shown by a glance at the plan (Fig. 20), the fortifications of the upper city exhibit great differences in strength and form. The most remarkable parts here comprise the south wall and the southern half of the east wall, especially since we have been informed of the plan of the frequently described so-called "galleries." The walls here, especially in their lower portions, are penetrated by long narrow passages e, adjoining which are externally a number of rooms f. These internal passages, as well as the stairways leading down to them, were all covered by means of corbelled courses of stones, and they were probably once lighted by openings like loopholes, as may still be recognized in the passage on the south side. What may have been the purpose of the arrangement described, cannot be stated with complete certainty; yet the author of the work on Tiryns properly refers to entirely similar designs within the enclosing walls of Carthage, which we know from Appian (Hist Rom. I. Bekker. 1842. P. 220,1-8) served as stables, as well as for occupation by men, provisions and war material.It appears questionable, how the now destroyed upper portions of the walls were constructed, and among other points, whether the plan of the lower casemates was there repeated, as in Carthage. To the inner side of the upper walls, and especially at the level of the pavement of the entrance street or of the fore-court, porticos seem to have been attached.

In the southwest angle of the citadel and on a natural projection of the rock is found a massive tower with two internal rooms, whose purpose remains uncertain, and further northward is an entrance stairway to the citadel, protected by a separate

external work, and by means of which a person coming from the sea would first pass up to the middle terrace of the citadel, and then by another stairway to the passage adjoining the men's hall of the Palace. Two other side entrances, which perhaps had the twofold purpose of serving as entrances and sally-ports, are found in the lower citadel; whether a similar one also once existed at the now destroyed southwest angle is no longer to be recognized. The principal gateway b could be used for chariots and horses, and turned away from the sea, lies at the middle of the eastern longer side, being accessible by a ramp 15.4 ft. wide, which ascends beside the wall. Within the gateway, the way divides to the lower citadel, to the middle terrace, and on the left to the upper citadel. The way to the lower citadel leads through a narrow alley between the eastern wall and the Palace itself, first through an inner barrier gate c, and thence by a separate ascent upward to the southwest angle of the citadel, from which by a sharp turn to the right, one passes into the outer propyleion i before the courtyard of the citadel. This propyleion , in its plan with external and internal porticos and the true gateway wall between them, represents the simplest form of the model for the designs of gateways later treated by Grecian art in such different ways. The base of the walls is rubble stone, the stone thresholds with holes for wooden door jambs, and the circular plinths of the columns are still preserved. From the inner portico of the propyleion, we can go through a narrow passage directly to the courts before the women's dwelling, and passing straight forward from thence, enter the great court. This is the fore-court of the Palace, entered through a gateway k, similar to the preceding one, but considerably smaller; one first enters a court of about 3380 sq. ft. in area, surrounded by porticos. Just on the right of the entrance through the gateway have been found the remains of an altar with a sacrificial pit. This was perhaps an altar of Zeus Herkeion, sometimes mentioned by Homer as found in the hall. The pavement of the court is almost entirely preserved and consists of a coating of lime, and the water is removed by a drain at the northwest angle. Opposite the altar and looking towards the south, lies the chief apartment of the Palace,

the men's apartment m (megaron), a rectangle 38.7 by 32.2 ft., characterized alike by its size as well as by its preferred location on the highest point of the rock of the citadel, and accessible from the court through a portico and a separate vestibule. Four columns supported the ceiling of the hall, at whose centre, in conformity to the statements of Homer, is found a circular structure, probably the hearth.

The dwelling of the women is on the east of the men's apartments, but it is not in direct connection with them. It exhibits a plan corresponding to that of the men's dwelling, though simpler; first a court, then a portico, from which one passes directly into the hall, and by side doors into the adjoining passages. The women's apartment has an area of about 46○ sq. ft.; a hearth appears to have existed at the centre, just as in the men's hall. The floor consists of a coating of lime. In the southwest angle, remains of the ancient stucco on the wall with painted decorations, have been found in place.

The purpose of the numerous other apartments of the Palace is not so assured as that of those mentioned. A series of rooms , accessible by passages and vestibules, lies in the northeast angle; in these should be recognized the sleeping apartments, and also perhaps the armory and treasury of the ruler. Two narrow adjoining rooms on the north side of the court, according to Dörpfeld's conjecture, contained the stairway to the roof, or to a possible upper story. From the court before the women's hall, one passes further southward to a third court. This, with all adjoining apartments, may have served for housekeeping purposes, and the rooms lying next the front gateway for the quarters of the guard and watch at the gateway. -- Another and in part badly ruined group of apartments adjoins the men's hall and its court on the west. Only one room of these may be determined with certainty, the bathroom o, whose floor consists of a single enormous slab of stone, 9.84 ft. w wide, 13.2 ft. long and 2.3 ft. thick, with a total weight of about 22 tons. On the raised margin of the stone, which has a channel for carrying off the water, are regularly spaced holes for dowells, according to Dörplefd's conjecture, for fixing a wainscoting of wooden planks. Fragments of a great bath-tub

of clay have been found, which stood in the room. The location of the bathroom is in the vicinity of the men's court, and its convenient connection with the magaron certainly agrees w with the ancient custom, also mentioned by Homer, of first giving in part the refreshment of the bath to the coming stranger, before he was received at the hospitable hearth.

The lines of the walls of quarried stone rise but little above the ground; we frequently find only thresholds and vestiges of their location; in other places, we still see on the external surface the clay coating up to 3.15 ins thick, covered by neatly smoothed lime plaster, partly with painted decorations. The few remains of building stones (quarried) make it p probable, that the superstructure was built of wood and unburned bricks. [1]

1. In the mode of building still common today in the Peloponnessus, and especially in the vicinity of Tiryns, with unburned bricks and wooden anchors, the enclosing masonry usually stands on a course of quarried stones, to protect the perishable material from water and from the dampness of the ground.

The painted stucco on the walls , with its rosettes and spiral forms (see colored plate II) and other ornamentation, indicate Egyptian art, and to the same source is also to be referred the decoration of a frieze pattern by inlaid slips and beads of blue glass.[2] But with these occur also primitive ornamental forms peculiar to the country; the heart-leaf, the ivy leaf, and the so-called wave ornament. The latter may indeed be native among all pepoles in all parts of the world,inhabiting the shores of the sea, as has been shown. (Similar frieze patterns are also found at Mycenae, on terra cottas in Cnossos, and on some stone friezes there.

Perrot and Chipiez have endeavored to give a general view of the external appearance of the Palace in their work.(See Vol. 6. Pl. 8. Southeast view of the citadel). In the Abhandlungen of the Bavarian Akademie der Wissenschaft, Reber and Bühlmann make the same attempt.(1898). Concerning both, Dörpfeld expresses himself in Athena Mitt. (1899) in the sense, that the restoration of Perrot-Chipiez "comes nearest the truth -- should indeed be termed probable. They assume flat roofs of earth

and crenelated walls as in Messene. Much stone and little bread! Likewise architect Restle attempts a nearer solution of the problem (in Luckenbach's Kunst und Geschichte, 1902, p. 5) by continuous terrace roofs and closed parapet walls. Professor Bühlmann, the gifted restorer of antique architectural monuments, sketches the interior and exterior of the Palace in a rather too refined manner. He skilfully combines the Lycian terrace roof above the round trunks of the ceiling and the side structures with the Grecian gable of the megaron. He assumes for the frieze, as a charactistic ornamentation there, the alternating vertical supports with the palm-leaves adjacent on both sides, as they are expressed as a plinth in Tiryns, as f fragments of stone friezes in Mycenae and Cnossos, and also at the last place on the larger pottery fragments of apparently the Minoan period.

The excavations undertaken in Mycenae in 1886 by the Greek Archaeological Society under the supervision of Tsountas [1] brought to light a second royal palace with a plan similar to that at Tiryns. The apartment of the one palace designated as the megaron is repeated in approximately the same dimensions, with its arrangement of portico, vestibule, of the men's hall with the four marks of the location of columns and the vestiges of the round hearth. These objects, as well as the existence of a threshold of breccia with four holes for the jambs and the limestone floor slabs of the vestibule, injured by fire, we have ourselves examined.

1. See Geschichte der Kunst aller Zeiten und Völker by Karl Woermann. Vol. 1. 1900. Perrot and Chipiez also give for the Palace in Mycenae (vol. 6, pls. 9, 10) two restorations of the citadel -- a southeast view and a view of the northwest side. Both exhibit crenelated walls and flat terrace roofs for the view of Tiryns.

The remains are shown by the corresponding plan of the citadel,[2] on which may be recognized the location of the court, of some subordinate apartments, and the stairway (20 well preserved steps). As at Tiryns, the plan of the building is only determined by a few courses of stone projecting above the ground.[3]

2. See Schuchardt. P. 319 to 329. Pl. 5.

3. Under these conditions, a fatal impression is made on those acquainted with the site of the building, and a misleading one on the reader, only deciding in accordance with the report, since in the illustrations things are represented as as existing, which are actually no longer preserved. Schuchardt, for example, describes (p. 321-324) wooden beams "as in the walls of Troy,"-- "the roof supported by four wooden columns," -- "and what is true for the plan (referring to Mycenae) is likewise true for the superstructure; everywhere the most striking agreement with the Palace in Tiryns. Floors, doorways, posts, thresholds, roof, everything is exactly as there." -- But there is nothing left of the columns, doorways or roof, as we have stated, and there are also no longer any beams in Troy! Now if it be stated even (p. 324), that the mural paintings are richer in one place than in the other, rather too much is still demanded from the reader.

On the northwest slope of the hill of Mycenae have been found passages in the walls, like those at Tiryns, and which are covered by ashlars corbelled out. Others are horizontally covered, so that in some places, the horizontal covering alternates with a polygonal one. In connection with these, a similarly constructed passage 4.26 ft. wide leads down about 50 steps to a c cistern. The very rough and irregularly dressed walls and ceiling are here covered by a coat of whitish-gray stucco 1.18 ins. thick, which follows the rough surface of the ashlars. The appearance recalls that of certain grottos of the late Renaissance, where the rock-work is made of stucco and cement mortar.

We may well assume in Tiryns a similar coating on the surfaces of walls and ceilings of similar passages in the walls. The use of these passages for storing provisions and for occupation by men and animals, thus becomes more probable.

What Schliemann and Dörpfeld began in Mycenae, according to K. Woermann, Chr. Tsountas has extended more systematically a and more scientifically.

The civilization at Mycenae and Tiryns is now generally referred back to the middle of the second thousand years before our era (entire absence of iron articles in the finds leads to

this opinion), and thus the fixing of the destruction of the palaces there at the time of the Doric immigration (1100 B.C.) may be accepted as correct.

The excavations in the rubbish heaps of Hissarlik (Fig. 23) have brought to light an enclosure of fortifications of small extent (one-third as large as those at Tiryns), defended by strong gateways and narrow towers, enclosing fragments of different buildings. Schliemann recognizes in them the fortress of Priam, the citadel and palace of the ruler of the Troy of Homer, and his opinion is shared at this time by influential savants. [1]

1. For the different views, see the writings of Bötticher, especially ; "hissarlik, wie es tat." Fünftes Sendschrieben über Schliemann's Troja. Berlin. 1890. Also Kunstchronik z. Zeit. f. Bild. Kunst. 1890. P. 242-254. Further, Schliemann. Ilios. Lastly, Durm. Zum Kampf um Troja. Berlin. 1890.

A sufficient representation of the whole is indeed given by Bötticher in his statement;: "One betakes himself to the remaining outer portion of the mound of rubbish, from which he loooks down, as if into a crater. The best place is above the so-called southwest gate. He sees a polygonal terrace, which is Schliemann's acropolis of Troy! The terrace consists of rubbish criscrossed by walls down to the original surface of the ground."

We give in Figs. 23 and 24 views from our own drawings on the spot, and also the ground plans of Dörpfeld in Figs. 25 a and 26 for further information, and from these it appears, that a ramp covered by great polygonal slabs of stone leads up to the so-called southwest gate, which by its design recalls Etruscan city gates. Within the enclosing walls are first two parallel rectangular rooms, separated from each other by a narrow intervening room, enclosed by unburnt bricks and subdivwded in depth by cross walls, which chiefly attract our attention and recall similar walled structures on the areas of the citadels of Tiryns and of Mycenae, where they are recognized as t the apartments of the men and of the women. The same applies to the superstructure, that has been said in reference to the two palaces in the Argolis already mentioned. Perhaps the representations on the Francois vase afford some starting points

for a reconstruction, though the temple and fountain-house represented thereon do not exhibit gable roofs, but rather straw and clay roofs of slightly cylindrical curvature. Singularly similar are the widths of the rooms A and B of the plan to those corresponding in Tiryns.

In his book [1] comparing the results of the excavations, Dörpfeld gives as the building materials employed for the palaces, limestone, air-dried bricks and wood, together with roofs of earth. He further states:-

1. Troja und Ilion. Results of the excavations in the prehistoric and historical strata of Ilion. 1870-1894. By W. Dörpfeld. Athens. Beck & Barth. 190z.

Whether the earthen roofs were preceded by such made of ordinary reeds or shingles without a layer of earth is uncertain. Those certainly presume a steep surface of the roof. But it is safer to assume an earth roof with slight fall toward all four sides of the building, where the layer of earth did not rest directly on the beams, but rather on a basis of reeds. (Roofing tiles of clay and marble date from the time of Roman possession). On the other hand, porous limestone, unburnt clay bricks and wood are shown in all periods of the citadel, the clay bricks being with and without chopped straw. Wood was employed in the construction of supports, ceilings, roofs, and as ties in the masonry, parallel and perpendicular to the enclosing walls. For the foundations was preferred split stone and air-dried bricks for the upper story.

Dörpfeld distinguishes between the following periods in his work.

a. The earliest settlement.

b. The prehistoric citadel of Troja (its most important i internal buildings).

c. Three subsequent prehistoric settlements.

d. The Troja of Homer,-- a Mycenaean citadel.

e. Two settlements preceding the Grecian.

f. The Grecian Ilion -- Temple and precinct of Athena Iliar.

g. The acropolis of the Roman city Ilion. Temple of Athena with dedicatory inscription, the great altar, small round Temple over the well, the Bouleuterion and the Theatre.

h. The Grecian and Roman lower city and the water supply.

Of these periods only those placed under b and d here have a technical interest, i.e., the most important internal structures of prehistoric Troy (Fig. 25) and the citadel of the Mycenaean period.(Fig. 26).

Of the former it is to be said in explanation:- We there passed from a fore-court through the gateway II C into a graveled second court, on which must have stood the great megaron II A without columns but furnished with an antedrom, hard by it being the megarons II E and II B, joined to which was another II H. "All these buildings appear to have had open anterooms toward the court." The structure II B was at first held to be a temple, "since its plan is similar to that of the simplest Grecian temple." Does the plan for the temple in the prehistoric period seem to have been assumed as assured? More correct must be the designation applied to similar rooms found in the excavations at Tiryns and Mycenae, especially in reference to their similar size. But the original dimensions can no longer be determined (see p. 85), and those drawn by Dörpfeld are arbitrarily assumed by him, about which it is known, that concerning the "rear ending of the building, one is still less informed," and likewise the former arrangement of the "stately hall" cannot be settled. Actually and technically with little basis or properly with none at all, not much is to be commenced with the ground plan, when further in principle the division into different building periods cannot be attempted; for just as 1 little as Rome, was Troja not built in a day, and by growth or also by extension after the destruction of each city, the same procedures occurred from the earliest time until the present day, that the old must give place to the new, and that only in time did the form of the city change in magnitude and importance. To learn to distinguish between the earlier and later works is the problem of the Epigones. The stones tell the story of each architectural structure, but one must understand their speech. Much more than the discoveries of the prehistoric city even those of Homeric Troja do not tell us. (See Text volume I, p. 107 et seq.). We learn that here also good tertiary limestone without mortar was carefully and even more care-

carelessly wrought, that unburnt bricks and wood were employed for the structures, and that it was possible to lay bare the eastern walls of the citadel down to the foundations.(See 6, the 6 th layer, Mycenaean citadel, the Troja of Homer. P. 144-150 and Fig. 26, the great tower of the 6 th layer (g). According to the indications on the plan and the rather broadly expressed text, we first have to do with a megaron, also without columns and with an anteroom, its hall 29.86 by 37.80 ft., that must likewise have influenced the temple plan of the ancient Grecian period. (Vi a). Then with a second megaron built of small limestone blocks (VI b), of which it is doubtful, whether the interior received daylight through the door alone or through windows. A support of the ceiling and of the roof by wooden columns is termed "entirely impossible." Further with the structure (VI M) consisting of several adjacent rooms, of whose purpose not much can be said; then with the buildings (VI G) and (VI F), about which nothing further can be determined, and finally with the great hall (VI C) 50.19 by 27.56 ft., that has an anteroom, and whose ceiling was supported by 3 columns, only one of which is proved. The two others are merely sketched in, "so that the columns form a middle row" and could thus bear the ceiling.(!). This singular evidence is similar to other previous cases. On the single rougr foundation stone discovered, and wrought in the same block with it, rises a slightly conical base 0.92 ft. high and 2.03 ft. in lower diameter. By the weathering of the surface, it is to be recognized that a column of only 1.25 ft. diameter and also of wood stood thereon. The building "may have been a temple," which possibility Dörpfeld is unwilling to reject, although in Tiryns and Mycenae were found no temples of that period.

Various arrangements of walls are to be distinguished, on t the other hand. The final results may then be summarized as follows:-

A massive enclosing wall with a superstructure of air-dried bricks and small limestone blocks, that is flanked by strong and widely projecting towers (Fig. 26). Through at least 3 gateways and one portal could one pass into the interior of the citadel. A certain number of the internal structures have

indeed been discovered in their ruins, but most were entirely destroyed.(P. 181). The "remaining"(?) structures represent separate houses, that have no common walls and are separated by wide or narrow passages. All buildings were probably placed on terraces. The date of their destruction cannot be accurately determined. According to the pottery found, the buildings belonged in the second half of the second millenium, thus in the period from 1500 to 1000 B.C.

If we desire to optain a correct idea of the artistic creations of the Homeric period, then we must not be merely satisfied with miserable architectural works. We must take into account what the fallen city once contained, which are the treasures found, the pottery, the vessels and tools of metal, of stone and bone, the works in gold and silver, the mural paintings etc. The first is is enumerated under 30 numbers as the so-called treasure of Priam (p. 325-343) and comprises objects of gold and bronze, weapons and ornaments. They are now partly preserved in the Antique Museum at Constantinople and partly in the Museum of Ethnology (Völkerkunde) in Berlin. According to these articles found, the tools were chiefly made of bronze, but besides the double axes, hammers and picks of bronze, stone axes were also found in the 6 th stratum.

More works in gold and silver were yielded by the buildings in Tiryns and Mycenae than by those of Ilion. The articles found in the localities first mentioned are well arranged and preserved in the National Museum at Athens. Representations of some are given in the little vignette of this volume (Fig. 1),;architectural fragments and examples of mural paintings are in colored plate II. Fig. 27 presents examples from Mycenae -- asses walking upright and pulling a rope or bearing a long spirally twisted staff, on which Woermann remarks (p.187), "that the Mycenaean half-ass is the ancestor of the Grecian satyr;" -- then the so-called flying fishes (Fig. 27) in free and sharply outlined drawing are represented in flat color tints on the basis of careful observation of nature. The motive of the flying fish is also executed in relief on greenish-blue vases and in the same free drawing. From Tiryns likewise comes the well known fresco piece with a man-juggling with an ox.

(See Perrot-Chipiez. VI. P. 886). From Mycenae is the painted tablet of limestone with the two female figures on the right and left of an idol, within an enclosing geometrical border.

Not sufficiently can the perfected beautiful gold and silver works be emphasized, as well as the chiseled and inlaid weapons, that in the good imitations of the "Geissling Metal Works" are to be found in nearly all European museums. Here also belong the wonderful cup of Vaphio, wrought in gold, with the captured bulls, and then the dagger from Mycenae, represented in color in Perrot-Chipiez (VI, pl. 19), the golden face masks for children and adults,[1] the splendid silver bull's head with golden horns, the wonderfully wrought diadems and cups, the numerous golden flower leaves, buds and ornaments for women, the little so-called altars or temples made in sheet gold, that a are poorly represented in Schliemann etc. I give one of these in natural size from my own sketch and remark thereon, that the three lyre-like forms in the lower panels, drawn by the authors mentioned, are bent at right angles and represent the so-called sacred horns, that we shall again find on Crete. On t the cross rails stand small grooved pilasters (see section, Fig. 28), and the wavy lines on the frieze above the middle part s shown in the illustrations mentioned, represent quite definitely and accurately the favorite palm-like growth at the right and left of the so-called triglyphs, that we became acquainted with on plate I of the volume. The sacred horns reappear in the crown at top. Six of the little altars in sheet gold found in the Museum mentioned exhibit holes in six places, from which it may be concluded, that they were fastened (sewn) on textile fabrics.

1. *See Benndorf, O. Antike Gesichtshelme und Sepulchralmasken. Vienna. 1875.*

A small gold plate, found by Dr. Kuruniotis in Volo, shows the facade of a house of the Mycenaean period with a great do doorway in the centre, with door and corner posts and closed door leaves, between the posts being ashlar masonry without bonded courses, for the end joints of the courses lie vertically over each other. Over the lintel of the door round beam ends mark the wooden ceiling of the higher central apartment,

and the same are above the ashlar work of the side parts, showing these lower ceilings. On these rest the parapet wall of an upper story, above this projecting from from the wall the beginnings of windows. As on the little temples, here are also small round holes at the cornices for fastening the piece on cloth.

1. Fig. 29 gives the small plate after an original photograph kindly placed at my disposal by Dr. Kuruniotis in Athens.

No perceptible fragments of the much besung Palace of Odysseus have been discovered, since the investigations so far made on Ithaca by Schliemann and others [2] have been essentially of a topographical nature; but the remains of an ancient palace near the Erectheion were found after 1887 within the Cyclopean enclosing walls of the acropolis of Athens.(See plan of the acropolis in Deltion archaeologikon. 1889).

"Room succeeds room, and its fore-court is well enclosed by walls and battlements; a gate of two leaves closes strongly; in truth, hardly may a man conquer it."

Thus is the "home" of Odysseus described. The hill of the dung of mules and of cattle before the gate of the court betrays the agricultural pursuits of the owner; the weapons in the men's hall, where fir beams and lofty columns were blackened by the smoke of the open fire and of pine-wood torches, indicate on the other hand the warlike spirit of the master. Stables for draft animals, wagons, and beasts for slaughter, mill and bakery, another court surrounded by porticos, beneath whose protecting roofs strangers reposed, and in whose midst stood an altar of Zeus, a women's hall with columns and adjacent apartments in two stories, are all well arranged together in the citadel. Purple coverings lie on the seats inlaid with silver and ivory; tables and stools, covered by sheepskins, fill the rooms; doors separate the rooms; they are lighted by golden lamps. Thus walls for defense and offense surround the master's seat; agriculture, hunting, war and an occasional raid for booty occupy the master, while house industries busy the wife, and a crowd of serving men and maids help in everything. A display of magnificent vessels, beautiful fabrics, women's handiwork, embroideries and woven fabrics is

made on occasion; in a large hall for drinking and weapons, the men assemble. [1]

2. See Schuchhardt. P. 341. Further, Dörpfeld now no longer seeks the home of Odysseus on Ithaca, but on the island of Leukas; -- see the essays of Dörpfeld and the corresponding opposed essays, also Ithaque la Grande, by A.E.H.Goekoop, Athens, 1908, which moreover have only a purely archaeological interest.

1. The restoration of a Grecian palace of the time of Homer and according to the Odyssey was attempted by Chipiez (Perrot-Chipiez. VII, pl. 80), regarding which it is stated in the accompanying note 1 (p. 81); "The best plan of the Palace of Ulysses ever given appears to us to be that made by Jebb, in his interesting study entitled, "The Homeric House in relation to the Remains at Tiryns." Jour. of Hell. Studies. 1886. P. 170-188). On plate 2, Perrot and Chipiez give a bird's eye view of the uncovered palace (i.e., the rooms without ceilings and roofs), which the plan of the building makes easily intelligible. Also see the ground plans of Jebb in Fig. 25 (p. 45) of this volume.

Additional and richer materials from the Mycenaean and from the still earlier period of Aegean art are presented by the n new excavations on Crete.

Arthur J. Evans [2] assumes a centralized and dynastic state between neolithic civilization and the Grecian colonization of the "geometrical epoch" for the great prehistoric civilization in Crete, and he takes for the three periods:-

2. See his essay, "Systeme de classification des epoques successifs de la civilization Minoenne. Athens. Petracos.

1. An early Minoan period (Epoque Minoenne primitive) with the following subdivisions; a sub-neolithic, when there predominate vessels polished by hand, of blackish or whitish ground color with white or brown drawings, then one similar but more advanced, and a third with a further development of the above mentioned, with the addition of the clay articles of the geometrical style with the first beginnings of polychromy, found by Miss Boyd in Gournia.

2. A middle Minoan period (Epoque Minoenne moyenne), again with three subdivisions, in the first of which belong the ves-

vessels found in the pillar rooms of the Palace at Cnossos, w while the second comprises those of the so-called "Çamares style," the clay articles being transferred to the third, in which the polychromy had disappeared mostly. In its place occur beautiful white drawings on a lilac ground, and the faience of Cnossos, as well as the use of hard materials for seals.

3. The end is formed by the third and last period (Dernier Epoque Minoenne, Late Minoan), again with the subdivisions, the first of which shows vessels with a yellowish or a whitish ground, on which are white, blue or reddish , sometimes very naturalistic drawings. The Palace of Agia Triada belongs to this period, as well as the great restoration of the Palace at Cnossos (the so-called throne hall). The great catastrophe of the second Palace at Cnossos marks the end of the period about 1500 B.C.

The articles found in the tombs of the acropolis of Mycenae chiefly belong to this time. To the third subdivision are referred the tombs of Zata Papoura near Cnossos, vases and weapons of bronze, goldsmith's work and ivory reliefs. Everywhere is noted the decadence od art activity. It is the time of the greatest diffusion of Mycenaean art, about the end of which the lands about the Palace were again settled.

In the following periodcoccurred at Cnossos a great change in the customs by an increased crossing of robbers with the p population. Iron replaced bronze, cremation succeeded burial, the use of hornbooks became common, though still without an example in the tombs of this period. The vicinity of the palace remained entirely abandoned and desolate.

This poor and final stage of the blooming period of Crete under the government of the traditional king Minos, according to what has already been said and by the excavations at various places on the island, gives no starting points for the form, the decoration and arrangement of the palaces of the ruler, or of the dwellings and tombs. We likewise obtain conclusions relating to the building materials employed, the structural details,and the tools used in construction. Whatever can still be traced in the course of the walls in Cnossos, Agia Triada, Phaestos and in Gournia -- to which chief places we must here

limit ourselves -- however, what the rich Museum in Candia under charge of Dr. Hazzidakis offers with its rich contents, cannot remain unnoticed, since it in part forms the starting point for the fortress palaces of Argos and for sacred Ilion.

The excavations carried on with great expenditures by the Director of the Ashmolean Museum at Oxford, but not entirely completed for lack of funds, afford us the greater example of a princely residence of the time mentioned. The name of Minos has slight bearing on the matter. What is presented to the observer is much and little, and it would be far less, had not such full concessions been made to modern "protection of monuments." One unwillingly asks himself for whom these structures were erected? Only too soon will he realize what he has and what he has forever lost. To render possible a representation of the original for some tourists, too much has been done. Much might be thereby excused, that structural works become necessary to support the falling parts; but novelties like a stairway extending through several stories with stone steps on impossibly shaped wooden columns, where furthermore scarcely one stone is ancient and genuine, must be too much. "O Solomon, I have surpassed thee," may the learned Englishman assert with satisfaction in reference to the executors of similar experiments on this side of the Alps.

On the site, no mighty stone walls and towers stare at us -- merely a lightly constructed outlook tower now rises with an elevated English flag, on the field of the excavations, not exactly to enhance the harmony, yet explaining the orientation to the earnest man as well as to the archaeological lounger. -- The Palace was an open structure, indicating assured possession, in a rich landscape with a view of the blue sea at an hour's journey, and of the snow-capped peak of Mt. Ida.

The centre of the plan (Fig. 30, the ground plan) is formed by an open court 95.15 ft. wide and approximately 229.66 ft. long, not surrounded by halls but paved with stone slabs, upon which open a part of the rooms on the longer eastern and western sides. The entrance is at the northern end through a gateway, with a guard house and open halls with two aisles on the left and right of the entrance street. Eleven pier bases of

the hall were found. At right angles to this plan we fing two great flights of steps, that are arranged about a standind corner of the wall, and indeed so that the smaller one turns to a terrace on the right, the other being perpendicular to this, now ascending by 19 convenient steps to the same terrace. The stairway had fallen and is in great part rebuilt anew. (Figs. 31, 32), a first gift for deciding on the grandeur of the plan! Parallel to this court is a second one arranged for the western buildings, that can be reached by a propyleion from the eastern side, or likewise through an open hall of the western portico. The western buildings of the great court fall into two halves, that are separated by a narrow passage paved with dark gypsum slabs, glittering in the sun. On the left of this are arranged narrow and deep storerooms with peculiar arrangements in t the floors, which with their strong enclosing walls lie next the western court, while on the east of these are found a greater number of rooms of a different kind, among which are the so-called "throne hall with bath," the lower lying vestibule, that opens to the great court by four doorways, the "throne seat" and the bench seats being the most notable objects.

Two views of this room with a great vase in the fore-ground, photographed before the singular restoration, are authentic a and were reproduced as half-tones in the "Annual of British School at Athens"(No. 6, session of 1899-1900. London. P. 37, 39). The view on p. 9 also shows the bath structure and the continuous steps leading down to the vestibule. The plain simplicity of this view has a good effect.

Interesting arrangements in the ground plan are presented by the complex group of structures on the east of the great court, sloping down toward the Karatos, and by its terraced design. The stairway is in the first place there with light court and its columnar passages on two sides. The steps are arranged with small risers and wide treads, and the ascent is more than comfortable, in contrast to what Grecian and Roman antiquity produced in this respect. The rise is 5.12 ins. and the tread is 18.90 ins. A view of the flight of steps and of the intermediate wall is given by Figs. 31 and 32 (from a commercial photograph by O. Maraghiannis in Candia), concerning which it

must be stated, that it does not at all represent their condition directly after the excavations. Of the restoration extending through several stories, the colored view taken on the spot (plate 3) gives an idea, after an original drawing of my pupil Aristides Zachos, who accompanied and assisted me during my last journey. Since stone, as a material, cannot be proved for the upper flight, then is a wooden stairway assumed there, which is not improbable from the kind of marks of fire on the masonry. The form of the supports, their present coloring, t the more than singular construction of the support of the steps and the underside of the flight are inventions of A. J. Evans and his architect. That everything was as it now appears, I cannot endorse, but it may arouse in a layman the conception, that it may have been so. For severe criticism or checking, there is too little of the old and too much of the new in the existing structure. It is difficult to come to a correct decision in matters, whose original condition is not visible, where the necessary and the superfluous are interwoven; but if the forms, as they still stand before our eyes in the monumental architecture in Mycenae, must also be deduced for Cnossos, --and that may well be--, then will the partial restoration, executed at great cost, not tell much, since uncertain structural forms enter into it, that merely afford opportunity for errors. For example, why are the unfortunate wooden columns in the form of colossal table or chair legs, varnished red and black, when the splendid stone as a material was available in blocks over 9.84 ft. long and 4.59 ft. thick, in the immediate vicinity, and when one remembers that architraves with lengths of but 5.25 ft. were concerned! More on this in the following.

But in the eastern buildings, there is still to be noted further a great hall, divided in length by piers and columns and with a portico before it, and that may pass for an assembly h hall, beside this being the so-called "megaron of the queen," with sleeping chamber, bath, privy and drains for removal of rain and sewage. This part of the plan by its intimacy belongs with the most instructivv vn the entire building. Men understood how to live, as the arrangements prove, and its former occupants are humanly nearer to us than the later born knights

of Tiryns and Mycenae. Another great apartment, turned more to the north, is designated as an "oil press room"-- the manufactory in the midst of the king's apartments --, from which a channel or a groove leads to a lower lying room, in which were placed the great and finely wrought vases (pithoi; Fig. 34). The Palace with its courts, passages and rooms of the most diverse kinds and purposes covered a vast area, that stronly invites to study. In the complex of walls, living and social rooms, Evans desires to recognize the so-called Labyrinth, that Minos had constructed by Dedalus as a dwelling for the M Minotaur. Taken all in all, England has made a gift of the first rank to the archaeological and scientific circles of Europe by the excavation of the Palace, by which men remain indebted in deep gratitude. That received on the whole, it must finally outshine the additions, that caprice and lack of technical knowledge have thrown into the bargain.

We learn by this more of the architectural powers and of the mode of living of the great in the second millenium B.C, than by many of the earlier discoveries.

That in the repairs and restorations, invention also had a word to say, is indeed intelligible. And that without repeated examinations from different sides, a final result could not be obtained, is also true. Great mistakes or reproductions in favor of preconceived opinions are blameworthy, if they can be avoided; false conclusions and erroneous assumptions are demonstrated by no well considered objective examination, and they are chiefly based on haste.

The designations of certain rooms may be accepted in general, but not in all cases. One does not readily recognize a living room 18.05 ft. in depth and 19.69 ft. wide, lighted only by s secondary light, and within which is built a bath 13.12 by 9.84 ft. = 129.17 sq. ft. of floor area, into which furthermore men might look between the columns, as a throne hall, and likewise see in the small stone seat (Fig. 33) a throne, or desire to give out the adjacent regularly arranged stone bench seats along the walls, that consist of regularly arranged small stone piers and slightly recessed panels, as the precursor of the t triglyph frieze of the Grecian wooden or stone temple! The

sublime idea was indeed originated by the finds in the excavations of the Americans in Corinth, where a triglyph-frieze was employed as a parapet in the design of the fountain(Fig.35).

Springer-Michaelis, at least in their Handbuch der Kunstgeschichte (editions of 1904 and 1907) make a bath and a bath chair of the throne hall and throne seat, but there are some impossibilities in the so-called hall of the double ake with the built platform, to which two wooden hen ladders must have ascended, not on the ground that they appeared in perspective according to Evans' geometrical drawings. Evans must have considered the Cretans as little people, becauee a passage from the ladders mentioned to the platform, with a clear height of 4.92 ft., he thought sufficient.(See Annual of British School at Athens. P. 111, 113; halls on east slope restored and hall of the double axes, cross section looking west, restored -- when the word "restored" is indeed superfluous).

To extend the record further would not be difficult -- but that must be here omitted. Let us as technical men pass to the technics.

For masonry we find employed the dense limestone and the gypsum spar dressed in large slabsand blocks. Both materials were used beside and above each other on the same structure. The walls are in part coursed throughout in dressed blocks, but also in part are with two faces, i.e. are constructed with stone spalls between upright slab-like ashlars. The faces of the l latter are without edge drafts, only being dressed with the tooth chisel, with strokes from right to left. Stonecutters' marks are everywhere shown on the external surfaces (Fig. 36). The heights of the ashlars vary from 0.56, 0.65, 1.08, 1.61, and 1.80 to 3.37 ft., their lengths from 9.86, to 10.5- and 13.12 ft., with bonding of 2.46 ft. in depth.

It is characteristic for the walls, that they mostly rise from a slightly projecting plinth.(Fig. 36).

Connections of the facing ashlars in the split stone walls up to 5.77 ft. thick by the insertion of pieces of wood cut in double dovetail shape may be assumed as certain, from the corresponding notches in the former. In the construction of the storehouses they are frequently preserved in the regular course 3.28 ft. high. (Fig. 3-).

In order to secure easily a beautiful jointing, the end surfaces are cut to less than a right angle in a technically inadvisable manner (Fig. 36). For split stone masonry, clay is determined to be the mortar. In the design of doorways, according to the dimensions and form of the door jambs and of the strike, specially cut ashlars were employed; first as framing, for the doorway, but also then to avoid extending the wooden framework and its covering to the ground, thus protecting it from the effect of dampness -- a method also still in use for new buildings in our time. Particular emphasis was placed on the condition of a durable and strong angle of the wall. These are mostly laid up in courses of hollowed out ashlars, that were joined together by dowells in the beds, so that the filling extended into the hollow up to 1.57 ft. The holes for the dowells still remain throughout (Fig. 36). The drains for water were carefully executed in the interior of the building and ended in special stones with openings, an example of the form of which is given in Fig. 36.

Building woods were formerly supplied by the famous cypress and cedar forests, that have now disappeared.

Concerning the use of bricks -- airdried and burned products -- as well as the mortar employed therewith (p. 37), certainly nothing is shown at Cnossos.

Of detached supports with architectural treatment,-- pillars or columns with definite forms of shaft, base and capital -- nothing has remained in Cnossos. The plain square piers of gypsum spath in the rooms of the storehouse with their stonecutters' marks on the external surfaces cannot be taken as such. Of shafts of columns, there lies in the vicinity of the little bath at the great tower, the drum of verde antique 1.64 ft. in diameter with a round dowell hole at the centre. In the bath mentioned is preserved the location of a stone column; at the great stairway to the different stories appear somewhat doubtful round sinkings with square borders, that Evans assumes as the places for wooden columns and has utilized accordingly in his restoration of the stairway.(See photographic view of the stairway, Fig. 32). There also exist still three round and flat shaped stone bases 2.76 ins. high and 2.30 ft. diameter

in the atrium of the eastern building, and at right angles to these stand three others (see ground plans and Fig. 36), that are similar to the low slabs under the shafts of ancient Egyptian columns. I sought in vain for the corresponding shafts, as well as for the proof, that just wood must be the correct material for the columns employed by Evans, and for justification of its treatment and use after the style of chair or table legs. The model in heraldic relief of the Lions' Gate in Mycenae cannot be assigned for this, just as little as the supports represented on engraved plates and stones, larger at top, since the former is doubtful, and both are not representations of or from monumental architecture. They are far more to be referred to the domain of art industry, they represent Hermes figures, as these were common on antique furniture from the earliest period. [1]

1. The young English architect of Mr. Evans, who accidentally sat at our dining table one evening, appealed to me in reference to the marble torch holder, 7.90 ft. high, at Eleusis, that is larger at top that at bottom, and which according to the existing dowells seems to have supported something; then it was said to him, that wooden supports with their thicker bottom e ends upward must have been so placed, because the sap would thus run out better, whereby the wood would become more durable.(Sic !). If one desires to appeal to stone precursors, then should at least the late Eleusinian torch holder -- the bundle of twigs transformed into marple -- be left out of the game, going to the south, and not to the north, to recall the perverse columns (Puchstein calls them sceptre or thyrsos columns) of the portion of the structure in Karnak built by Thothmes. On the shaft of the column, slightly enlarged upward, stands an inverted bell capital, with leaves growing downward. The shaft must there be somewhat enlarged upward to be able to receive the margin of the bell, and it naturally has there its greatest diameter. The stone column reproduced in Lepsius (I, pl. 81), also represented in Perrot-Chipiez (Egypte, p. 558, 572), is stumpy, 19.69 ft. high with a diameter of 3.94 ft., and it is just perceptibly enlarged upward, only so much as the eccentric capital required. It is a work of the 18 th Dy-

dynasty (1697-1444? B.C.), in which the inverted capital had the inverted shaft as a necessary result.

The Egyptian artist remained logical in this -- the reversed for the inverted; the Cretan was not so, if according to Evans he proceeded according to art industrial precursors in his monumental architecture. (See what is said concerning the Gate of Lions).

But proof is required, when the savant mentioned technical men of other nations state, for example concerning Cnossos:- "Very important is finally the finding of a column of cypress wood, preserved for almost its entire height, whereby the characteristic diminution of the wooden support downward, also tr transferred to the stone columns of the time, can at last be proved by an original example."

Charred pieces of wood (see my essay and illustrations in the Jarheshefter of the K. K. Oest. Arch. Inst. Vol. 10. Vienna. 1907), as well as charcoal remains placed in a gypsum sarcophagus were brought from the locality of the find to Candia, where they are preserved and publicly exhibited. Whether these were remains of ceiling beams or of posts, history is silent. In which room of the palace and in what position they h had fallen and were found, is absolutely immaterial, since the specimens are indeed nothing more than shapeless remains of wood, without any vestige of architectural subdivision and also without any mark of a technical treatment in the material.

Also in itself, a conical piece of wood does not long tell, whether it stood with the thick or thin end on the ground, where all members preparatory to a base **or** capital are lacking.

To the shafts of columns restored from these scanty and entirely irrelevant remains of wood were now erroneously added broad- headed forms of capitals -- forms that contradict the nature of wood -- which Evans had executed in relief in the restoration of his stairway and light court, with the addition of heraldic colorings, that mock all statical and esthetic feeling. Likewise the conclusions derived from mural paintings for the forms of columns under discussion are deceptive conclusions, since they are based on false assumptions.

Wooden columns enlarged upwards and with wooden capitals in

the style of the painted or stone forms, similar to those of the stele at the Lions' Gate or the half columns at the Tomb of Atreus at Mycenae, have never yet been proved in the palace structures on C.ete, but are rather the products of a wild imagination or are caprices.

When it is further stated:- "Of the elevation of a Mycenean columnar facade with similarly formed supports, the remains of a mural painting further give a priceless representation," it must first be asked, where Mycenaean facades occur in general. The plans of the Palaces at Phaestos, Gournia and Cnossos exhibit none, and we just as little find such on Assyrian palaces or on Egyptian house architecture. Colonnades in antis or as ceiling supports in halls and corridors; yes -- but none are peripteral.

I have expressed on page 64 my opinions concerning the value of the mural painting referred to, adding a sketch with dimensions. But a few inches thereof are authentic, all the remainder being the free invention of Evans and his assistants.

I oppose this comparison without prejudice, and as a whole it does not come within our consideration. Only the "rudera" of the little columns, originally only 1.97 ins. high, attract us. [1]

1. See the colored representation, not entirely corresponding to the original in the Museum at Candia, published by Fife. Jour. of Roy. Inst. of Brit. Architects. London. 1903.

Only the drawing of the capital of the column standing in t the right space is preserved, with only the upper half of that in the left space. What form the shaft had is no longer to be stated. The shafts of the two little columns in the central space are without diminution, contrary to the colored English reproduction.

Merely the lower half of the left one remains, i.e., a black plinth and a portion of the shaft, with the similar plinth of the right one, the shaft and in part the capital being colored red. Their forms on the whole recall that of the stele in the tympanum of the Lions' Gate at Mycenae. From this pretty little painted column cannot be deduced at all a canon for its proportions on the basis of the upper diameter (since the lower

one is no longer determinable, and to desire to establish it as a module appears still more venturesome.

But for the form of the premycenaean column, a gayly painted border is appealed to, that as the upper termination (see the representation in the aforesaid Aufsatz der Oest. Jahreshefte) exhibits a series of small vertical supports 3.15 ins. high, which recall certain turners' work of a very much later time. In connection with the rosette border drawn beneath, w with which the series mentioned must harmonize, the whole may be designated as a pleasing work of art industry; to wish to derive monumental architectural forms from it appears unjustifiable, so much the more that the border might also extend around the rectangular panel, just as in the painting with the capture of the bull, or on the panel with the so-called labyrinth in the Museum at Candia.

The mural painting mentioned, representing a religious festival or an assembly of people, therefore presents to us a real architectural gift in a form of column, that recalls Egyptian origin, but likewise occurs on Etruscan mural paintings, and according to its magnitude and proportions -- diameter to height -- must be regarded as architectural and monumental.

It consists of the cylindrical and stumpy shaft, painted red, without base and crowned by a square abacus, without the intermediate echinus. Between the abacus and architrave is inserted a wooden cap. Above the architrave are indicated the well known round timbers, then the framework, on which are shown t the so-called sacred horns, behing which rises a structure of doubtful shape. The abacus capital shows a border painted blue and a middle part painted the same color, while the fillet around the latter is light in tone and beset with red disks. An enlargement of the shaft of the column upwards does not exist.

On this simple occurrence of a unique column, on a somewhat fanciful painting, should not be placed full value perhaps, if not contrary to all reflections, it were removed from doubt, and we have to do with an assured architectural form by the f finding of a steatite vessel in Agia Triada by the Italian Society.

In similarly perfected manner as an another famous vessel in steatite from the same locality, described by F. von Duhn in such an energetic way [1] and represented in the reports of the Italian finds, there are represented on the recently found vase of funnel shape figure compositions and architecture, among w which are columns, that repeat in low relief the form drawn in the paintings.

1. See Deutsche Rundschau. Heft 12. P. 348 et seq. Italienische Entdeckerarbeit auf Kreta. Berlin. 1903.

The vase with its fine low sculptures is left in the natural blackish-gray color of the material, nc application of color enhances the decoration, and the form alone speaks. Of funnel shape with an added handle, it measures 18.31 ins. high with an upper diameter of 7.09 ins. It is divided into four zones, which are separated by triple rounds. On the first, third and fourth zones are represented combats of men, on the second being bull tamers. On the first and third zones , three columns on each support the dividing bands, but these are lacking on the second and fourth. The shafts of the columns are diminished upwards, are without bases, and they support a square abacus capital without the intermediate echinus, just as on the painted column. In harmony with this, the surface of the abacus is sunken at the middle, and the outer border is beset by circular disks. A cap placed above extends the bearing of the horizontal dividing beam (Fig. 37`, in which the columns are represented from my own sketch).

The form of the capital reappears in the mural paintings of the Etruscan "Tomb of the Bulls" at Corneto-Tarquinia; red shaft and red capital with black border. [2]

2. See Antike Denkmäler II. Pl. 41. Berlin. 1901.

Among the finds in the Museum at Candia is yet tc be mentioned a curved stucco fragment, that must be regarded as a portion of the shaft of a column of small diameter. The surface shows on a light blue ground the zigzag ornament and spiral lines in white.

A frieze ornamentation, sometimes executed on mural paintings, sometimes in relief on red porphyry or greenish alabaster, consisting of vertical parts with adjacent palm-leaf ornamentation on the right and left of these, which has given opportunity f

for varied explanations, is also to be mentioned in Cnossos.

It was first made known in the description of the acropolis of Tiryns (see colored plate 2), there designated as being executed in alabaster with blue glass inlays; another example from the Tomb of Atreus in Mycenae and carved in red porphyry (see plate 2 already mentioned), is preserved in the British Museum in London, two other pieces of unequal sizes, likewise in red porphyry and found in Mycenae, are to be found in the National Museum at Athens, and a last one known to me in bluish green stone (alabaster) is in the Museum at Candia. They vary in height from 21.65, 11.81 to 9.84 ins, being only 7.48 ins. in Cnossos. What exists in relief objects appears to have been tory from their architectural surroundings, and only the painting in Cnossos givvm the location of the ornament beneath the position of the column, the so-called gold triptych (Fig. 28), but as a part of the frieze under the main cornice. Thereby the "ever recurring" rosette band as the base of the wall would not be authenticated. The same ornamental form is also found on the yellow clay vessels with brown drawings of the third and last epoch of the Minoan period. [1]

1. In the work "Ovalhaus und Palast in Kreta" by F. Noack, 1908, I am informed with reference to my final conclusions (p. 37, Note 35), that the vase of a "much" later style illustrated my me in Oest. Jahresheften X, 1907, only belongs to the e end of the "palace style." For my final conclusion, this is on the whole immaterial. The fact is, that the said vase at the time of my drawing stood in the Museum at Candia in the case, whose contents were recorded in the second Minoan period. In the essay of Mr. Evans are only vases with yellow ground and brown drawings were referred to the third epoch, that ended with the great catastrophe of the second palace at Cnossos, a-about 1500 B.C. An error was only made by me, if Mr. Noack c can prove by the facts, that the stone frieze under discussion was older than the similar drawings on the clay vessels.

Painted representation preceded the execution in relief on stone. As stated, it has been desired to explain in it the p precursor of the triglyph frieze of the Grecian Doric temple and of other public buildings of that style. The explanation

and derivation, according to Vitruvius and now generally accepted for the Doric triglyph frieze would forbid this. Its arrangement as the plinth of a wall would be foolish.

In the excavations of the Americans in Corinth, [2] as stated, there was found above a plinth 0.28 to 1.12 ft. high a gayly painted stone triglyph frieze 3.28 ft. high with a cornice projecting 0.46 ft.(without mutules), as a parapet wall at the E fountain house and with consecrated gifts placed thereon, which informs us, that already Grecian masters did not very strongly accept the theoretical derivation of the frieze from wooden c construction, when the triglyph frieze had become petrified into a typical ornamental element.

2. See Fig. 35 and American Journal of Archeaology. Vol. 6. 1902.

In the Doric frieze triglyphs and metopes are separate, apparently in themselves actual members of the construction with a close spacing of the triglyphs. For an ornamentation of the frieze by figure or ornamental decoration, the metopes remain separate from the triglyphs. It is otherwise on the premycenaean and Mycenaean friezes, on which the palm leaves developing at the sides over part of the space belong to probable triglyphs. Two such palm leaves touch each other at the middle of the so-called metope panel, requiring an elongated form of this with a wide spacing of the dividing marks. This is the very strongly prominent characteristic difference between the two. Men would indeed neither wish to recognize harmonizing ornamental forms with vertical separations and two sid palm leaves from Tiryns, Mycenae and Cnossos on bench seats, on wall plinths, nor beneath the main cornice, or on detached blocks as portions of the original form of a Doric triglyph frieze.

The plane ceilings of halls and of rooms in the Palace were certainly constructed of wood and covered by stucco, that was in part decorated by painted patterns in relief. These recall in their drawing that part of the ceiling in the domed Tomb at Orchomenos executed in stone (Fig. 38) or Egyptian precursors. The scrolls are wrought with moderate skill, the intermediate lozenges bear yellow rosettes with red receptacles and ribs on a light blue ground. The eyes of the volutes are likewise col-

colored blue. The original pieces are in the Museum at Candia, and a reproduction of the same is in the British Museum in London, from which the adjacent Fig. 38 was drawn. But ceilings in which the woodwork remained visible may also be assumed, e even if vestiges of such cannot be established. The wall surfaces in subordinate rooms, for example in the storerooms, were coated with gypsum mortar 0.79 to 0.98 in. thick and white washed. In them the lower part of the wall to a height of 3.28 ft. was painted white, then a plinth being indicated by a broad red band and a groove above it, the light color being continued above this without further subdivision. The walls in the bathrooms were frequently covered by slabs of gypsum spath 6.56 ft. high, above which commences the plastering and the painting; coverings of painted terra cotta [1] are to be mentioned in addition to this mode of decoration. In other rooms are painted plinths on the walls, that imitate different kinds of marbles, just as awkwardly as the painted imitations of marbles in our mediaeval Romanesque churches. Again in others the wall surfaces are separated by borders, that likewise imitate marble inlays (mosaics in hard stones), or treated as rosettes and bands in bold and bright colors.

1. *A bathroom with the foot bath.*

But a maximum in richness is attained in the mural decoration by inserted fresco pictures, which sometimes cover surfaces of 2.79 ft. high (for example, representing bull tamers); but more yet by the life size figure compositions, that are in part executed as painted stucco reliefs, and in part more plainly as flat paintings. Here belong the remains of the upper part of the body of a youthful figure with a neck band of lilies [1] and the arms of a man holding a pointed vase, executed in hard gypsum, then the procession of people bearing vessels in full life size in the so-called procession corridor of the Palace; one figure in low relief and painted, which is in stucco relief ((restored) like an Indian chief gleaming with warlike ornaments, the realistic bull'. head, and many others. Notable in ornamental respects is the gay border on the garment of a queen (?), wine vase borne backwards, and portions of the frieze with naturalistic flowers, white lilies with stamens and green

leaves in excellent drawing, rising from a red ground. As portions of a mural decoration might I further designate the fragments of a rosette band of gray alabaster, that is masterfully cut from stone with great certainty. The form of the rose leaves recalls those of the palm-like composed probably triglyphs.

1. See Annual of British School at Athens. No. 7. Session 1900-1901. Pl. 6. P. 17, 89.

The floors in the corridors and rooms are entirely constructed of smoothly wrought large slabs of gypsum spath of light, though bluish color. In the long corridor before the store-rooms they have a square form with 2.76 ft. sides, it being assumed that they are still the ancient ones.

Of high artistic value are the pieces found belonging to the furniture of the dwelling, that are preserved in the Museum at Candia. The most remarkable among these, and a pearl of antique art industry, is the so-called game board, more correctly indeed being the cover of a coffer. 3.38 ft. long and 1.97 ft. wide, that is artistically composed of ivory with inlaid rock crystals, between narrow gold bands, stripes and flower bands (marguerites) of blue enamel and rosettes of crystal plates on silver foil. [1] The drawing is just as beautiful as unique with a splendid distribution of the colors. How much of this is to be attributed to restoration may remain doubtful at first. Precious likewise are the little patched-up majolica ladies (Fig. 41), as well as the little soaring nude figures carved from ivory with gilded hair wrought from lead. Entirely the work of minor sculpturs of good rank. Such a little dame in similar toilette and with luxuriant hair, apparently found in the Troad and executed in bronze, is to be found in the Berlin Museum. (Fig. 41).

1. Must not this kind of surface decoration have some connection with that made known on the wall surfaces of the Palace at Tell-el-Amarna in Egypt? Has it not likewise a similarity to the finds in the Palace at Tiryns, where enamels appear in an alabaster frieze (see colored plate 2 at page 40), at least in a technical respect?

There is further to be recalled the stone bath chair previously mentioned -- or throne seat with high back and hollowed seat;

(Fig. 33); a copy of the same in the British Museum in London) as the the quite unique and partly like the Egyptian in shape, stone lamps, stone vases and clay vessels,(See Jahreshefte d. Oest. Arch. Inst. Vol. 10. P. 63. 1907).

Of equal importance with the treatment of the living and social rooms is also that of the storerooms, which were accessible from a corridor 45.60 ft. long and 6.33 ft. wide and could be closed by doors. Every corner is utilized in these rooms. Around against the walls stand the great vases (pithoi) for containing oil or other liquids, as still common today in the sale storerooms of Candia. Nothing has changed here, neither the form of the clay vessels nor the mode of keeping the products. The free space between the vases is sunken and is divided into rectangular cavities 3.22 ft. long and 1.48 ft. wide, which are lined with slabs of gypsum spar 1.97 to 2.76 ins. thick. The slabs were either gained or abutted against each other, the cavity itself being again covered by slabs and designed for keeping fruits. Likewise must here again be reference be made to the splendid clay vessels 6.56 ft. high in the eastern building with their four rows designed for passing through ropes for transportation to the kiln.

The greatest diameter of these splendid vessels amounts to 4.59 ft., the thickness of their walls is 0.79 to 0.98 inch, and the hard burned clay is mixed with small pebbles.

The new stairway in two flights between the stories is 6.17 ft. wide with risers 5.12 ins. high and treads 18.90 ins. wide, is open toward the little court 11.48 ft. wide and 18.05 ft. long (see colored plate 3); instead of external string walls, supports of the flight by wooden columns are assumed by Evans, to which circular sinkings in certain uncovered slabs may indeeed have led him.

The construction is neither antique nor very thoughtfully worked out. Who has ever set masonry stair steps on wooden c columns and laid stone streads on sloping beams, sheathing these underneath with boards, or placed detached wooden posts in stone sockets? The building police, sound human reason and understanding of technics have forbidden it here.

According to the great mural paintings, gable roofs were ex-

excluded in the form of the roof and only the clay terrace roroofs on round logs were permissible as in Asia Minor.

The materials for a restoration of the Palace are apparently rich; we know the ground plan, the construction of the walls, the location of the stairways, the indications of the supports, the method of decorating the interiors -- but still the elevavation of the external architecture will first remain a book with seven seals.

Information concerning the external appearance of the houses near Gnossos is given by a great number of small porcelain tiles, some of which are shown slightly enlarged in Fig. 42. They are stone structures in one or more stories with flat roofs and part have a raised structure at the centre. Much for the imagination, little for plain reality.

Of a somewhat smaller palace design on Crete, a comprehensive essay by Luigi Pernier affords conclusions. [1] We here likewise find the different rooms grouped around a central court, that is 72.18 ft. wide and 154.20 ft. long. On the east lie the women's apartments with a megaron formerly adorned by columns and an adjacent portico, a bath etc.; on the west are the megaron of the men, the throne hall, the bath and the storerooms, separated by a long corridor. Massive flights of steps and small connecting stairs lead up to the living and assembly rooms.(See ground plan; Fig. 43). Charred timbers were also found in this building. L. Pernier says, that this building material found extensive employment, indeed as shafts of columns (?), pilasters, girders, beams and rafters. Further in the form of boards for covving doors and walls as well as for floors.

1. See Nouvmber, 1903, Heft of Revista d'Italia under the title of Il Palazzo, la Villa e la Necropcli di Festa.(Scavi della Missione archeologica Italiana a Crete. 1900-1903. P. 763-789.

Three kinds of stone bases were determined; those in form of great disks or frustums of cones, others made of lower round stone slabs, and still others as square plinths with their round disks to receive the column, made of limestone, marmo venato, conglomerate stone or gypsum spar.

The internal decoration in great part consisted of painted stucco. The painting was the simplest conceivable. The panels preserved in place exhibit a red tone with the simplest geometrical ornaments. Others are entirely white with dark plinths, yet othess are likewise white, enclosed by broad red horizontal bands of incisions, or orange yellow enclosures with red zigzag lines. Some floors were also of red or whitte stucco surrounded by red borders and decorated by palm-leaves or spiral lines.

Federigo Halbherr discovered in 1902 a "Villa Micenea" near Phaestos, that occupied an area 328 ft. long and 49.21 ft. wide.[1] Similarly constructed and decorated, just as few columns of any material were there found, as at the palaces now treated, in which only bases could be determined.

1. *Resti dell' eta micenea scoperti ad Haghia Triada presso Phaestos. Rapporto 1902. Rome. 1903.*

The further discoveries after 1902 of the ruins of Agia Triada are givvy in the ground plan of Noack (Ovulhaus und Palast in Kreta, 1908, p. 30) and are properly interpreted, so far as possible.(Also see on this, D. Mackenzie, Cretan Palaces and the Aegean Civilization. Ann. Brit. School at Athens. No. 12. 1905-1906). Then W. Dörpfeld, according to whom "the destroyers of the ancient Cretan Palace carried the old plan of their houses with them into the conquered country, and the caused to be built their Palace by the native workmen, with some peculiarities borrowed from the ancient Cretan palace." -- A perception later changed by him. "That the later Palace built for the Achaians by the native architects differed but little from the older one, and that only a certain relationship with the Achaian palaces of Argolis can be recognized." Noack is of the contrary opinion; that the older of the two palaces in Tiryns was built at the same time as the later Cretan palace (P. 35). And these must have long existed, when the remaining later Palace in Tiryns was built, near which stands that of Mycene. "The Achaian palaces of Argolis are too late, therefore the later Cretan Palace must have influenced those of the main land; for the various art forms, as well as the mural decoration in Tiryns, Mycenae and even Orchomenos exhibit the style of the

great art of the later Palace on Crete," a conclusion that may also apply to the older Palace in Tiryns. Crete thereby remains the giving part; the seats of the giants of the main land are receiving in a certain sense -- a hypothesis, that most m merits belief and with which one can agree.

On Crete, in accordance with the well known oval urns for ashes in form of houses,-- was found the Oval House, or the elliptical form of house in the ruins of the House of Chamaizi - Sitera. Discovvmed by S. Xanthydides, to whom we owe the first careful publication concerning it.(Ephem. Arch. 1906, and Noack, p. 53, 57, then Bulle, Orchomena 126, with the adjacent illustration from Noack; Fig.44).

Conceived as a "single room," such an owal house is nothing more than the circular house; as an interior with several cells, the interior appears somewhat cramped, even comical. One asks properly; why with straight partition walls are the outer walls curved, which only cause difficulties in the treatment of the roof? We recall mediaeval round towers changed into living r. rooms in the Renaissance period, where men make a virtue of necessity.(Fig. 44). Likewise for the Cretan "covered buildings", the external walls and the roof must be older than the partition walls of the interior. The skylight in the roof for lighting the internal rooms does not appear very original.

Prehistoric investigators (Montelius and Sophus Müller) desire a clean separation between the curved structure -- as the primitive European form of house -- and the rectangular house, that was a creation of the East. Others wish the rectangular architectural form in the South to pass merely for an influence from the North. Thus Bulle (See Noack, p. 54) asserts, that the "megaron house" could only be invented by a northern people, who required warmth and placed the hearth at the centre of the house. Padroni (L'Origine del Domus. Rome. 1902) says on the contrary, that a "house adapted to the South" could not have been brought from the interior of Europe, but only over the Mediterranean from the East to the North. The South requires from the house protection for the occupants from the sun's rays, the possibility of a cool and airy living in rooms open above, and that of enjoyment within solid walls without windows, and

not like the north, the tepid interior enclosed on all sides, with permanent ceiling and closed roof with admission of the light at the sides trhough windows, through which in good and bad weather were received light and air. (See Durm. Baukunst der Etrusker und Römer. 2nd edition. P. 482). The megaron w with high side light or with open attic over the four columns is therefore only possible in the South, in a climate free from rain, snow and ice.

Noack examines the ground plans of Mycenean and Cretan palaces with reference to architectural axes. He will not find such, in the sense as understood in building plans. At it appears, he confounds building lines with building axes, according to the parallel lines drawn by him on the plans of Agia Triada.

Architecturally of the highest interest is at the place mentioned the brightly colored drawing of a great entrance doorway, represented on a sarcophagus with ornamented jambs and lintel (Fig. 45) above a plinth adorned by rosettes.

Further excavations on Crete brought to light near Gournia a fourth palace, concerning which Miss H. A. Boyd gives conconclusions, and whose ground plan with subordinate buildings by Fig. 46.[1]-- It has in plan much allied to the greater buildings, as for example the great court and the storehouse, but it is radically different from them in construction. Instead of ashlar and split stone walls occur foundations and walls of the stories built of bricks with lime mortar.(See page 37).

1. See Gournia. Report of American Exploration Society's Excavations at Gournia, Crete. 1901-1903. By Harriet A. Boyd. Vol. 1. No. 1. 1904.

The base of a columnwas also discovered. Of greater importance is the finding of many bronze tools in well preserved condition.(Fig. 60).

Of the buildings mentioned as of this period, only the so-called Lions' Gate in Mycenae has answered questions relating to architectural forms -- and there appears only a single half column (stele) of vanished splendor! Works, that might give give evidence of the magnificence and comfort of the living, have disappeared. Only those built for the dead now speak in

the royal tombs on Crete, in Argolis and near Pantikapeon. T They show us the structural and form treatment of isolated supports (columns), walls and ceilings, and they bear within themselves the germs of the later developments of these elements of architecture on European soil.

If the tomb near Cnossos has nothing to givv in ornamental respects, then we are compensated by some technical procedures. On a square plan rise two vertical ashlar walls and two in the form of a pointed arch. The latter rest against a common ridge and at the same time form the wall and ceiling. A passage (dromos) is flanked by ashlar walls and leads to the entrance, that was covered by corbelled courses of stone. In its vicinity are arranged two niches opposite each other, 3.90 ft. wide and 3.77 ft. high, likewise covered by projecting courses. The walls of the tomb chamber and of the passage stand against the solid ground and are built with two faces. The external and internal ashlars were connected by wooden dovvvailed anchors, according to still existing indications.

The faces of certain stones bear the same stonecutters' marks as at the Palace at Cnossos.The bed and end joints of the white limestone blocks, set without mortar, are filled by thin plates of blackish limestone (limestone slate). The stones of varied lengths and heights were covered by a thin coat of plaster. The floor area of the tomb chamber measures 20.15 by 25.99 ft. (Evans makes it 19.87 by 25.18 ft.[1]); the surfaces of the vault correspond to the longer sides, that are constructed by corbelling (false vaulting). The five lowest courses thereof are still in place, the succeeding ones being wanting. The fifth overhangs about 9.45 ins., by which the line of the vault can be determined.

1. See Archeologia or Miscellaneous Tracts relating to Antiquity. Second Series. Vol. 9. Prehistoric Tombs of Cnossos, by Arthur Evans. London. 1905; -- and Durm, J. Die Kuppelgräber bei Pantikapeon in the Jahrb. d. K. K. Oest. Arch. Inst. Vol. 10. Vienna. 1907.

It appears singularthat the beds of the vault stones are dressed definitely less than at a right angle (See A. Evans and J. Durm), and thus are not horizontal. A cowering slab was

common to both compartments of the vault and closed in the interior, so that the ridge showed no continuous sharp angle.

A. Evans places his "Royal Tomb of Isopata" in the second Minoan period, thus in the time of the 16 th century B.C., thereby dating the Cnossos tombs earlier than the tombs in Abydos and thebes.

The Lycian roof in form of a pointed arch over a rectangular plan is to be recognized in the vaulting. In the Lycian rock-cut tomb,-- a later imitation of archaic wooden construction -- is embodied the dwelling, in which according to the belief of the ancient peoples, the souls of the dead spent their existence. The interior can pretend to a certain internal effect, and it indeed reproduces the image of the ancient royal apartment, that formerly can scarcely have lacked an ornamental decoration.

That men had the intention to produce a considerably spacious effect in the interiors of the tombs may well be assumed, and that they desired to enhance this effect some centuries later in the Argolic royal tombs is just as certain. Already the more important dimensions and the return to the primitive (also Phrygian) circular form of the hut of brush or earth permits this conclusion. The round form allowed great spans without technical difficulties, the uncovered passage (dromos) and the massive portal (Fig. 48; view of the existing condition) permitted the lighting of the interior of the tomb by daylight, without the aid of artificial light.(Fig. 51; plan and section).

In erecting the vault , the centering may be omitted and the danger of its fall during or after completion of the work was decidedly less in comparison with the tunnel vault. .

The acceptance of false instead of true vaulting was here justified from a technical standpoint and is no indication of decadence. Technically well planned is likewise the mode of relieving the great lintel of the doorway, which is constructed like that on the Lions' Gate, excepting that here the ornamented triangular slab, for closing the space left open over the lintel is now wanting.

The ascending courses are covered at the vertex by a larger hollowed horizontal stone slab without radial jointing; the

formerly existing holes near the vertex are again closed. Marks of a former metal covering of the finely joined and polished surfaces of the vault still exist in the form of bronze pins, as well as the remains of the treatment of the portal and of the structure above it. They afford evidence of the form of the door, the enclosure of the doorway, the half columns and cornices and decorated slabs -- thus of the most important architectural elements.

A thorough representation of this and of the nearest circular tomb (tholos) in Mycenae with illustrations was given by me in the Jahrb. d. K. K. Oest. Arch. Inst. in Vienna in 1907, of which it will only be emphasized here, that the jointings of the stones near the vertex have not been correctly represented heretofore, but that especially the statements concerning the half columns flanking the entrance must be considered as not sufficient in all previous publications. [1] (Figs. 47, 50; the entrance facade).

1. Also see Thiersch, F. Die Tholos des Atreus zu Mycenai. Mitt. d. Kais. Deut. Arch. Inst. P. 177-182 and Pls. 11-13. Athens. 1879.

On the basis of hasty observation and of bad plaster casts of the heraldic ornamentation on the Lions' Gate and the existing remains of the capital, as well as the neglect of the still preserved bases of the columns, men have assumed shafts much larger upwards, since such occur under other circumstances in antique architecture on but one building -- the hall i in Karnak built by Thothmes.(1597-1447 B.C.). By the finding of the lost shaft of the column among the property of Lord Sligo, which is now placed in the British Museum in London, and from a fragment built into masonry in Nauplia (now in the National Museum in Athens), the proof is made, that the Mycenaean architects had before the Trojan war just as much correct artistic invention and technical intelligence as their predecessors on Crete. Fig. 47 gives the present condition and the various assumptions for the treatment of the portal with its half columns, among which is also the only correct and possible one. On the other hand, Fig. 49 shows by sketches how the zigzag mouldings and their spiral ornaments on the shafts of

the columns actually appear.

That the rectangular surface of the wall over the doorway w was covered by decorated slabs may be recognized by the metal pins or their marks in the ashlars, and may be seen from the remains of friezes found, now in the British Museum in London and in the National Museum in Athens. That the relieving triangle was formerly closed and not designed for the admission of light, must be assuemed as assured by the precedent at the Lions' Gate and according to the adjacent Tholos.

Small holes arranged in horseshoe shape (Fig. 50) and others at the angles of the lintel of the doorway permit the inference of applied bronze ornaments on the facade. For these are now assumed lions' heads and owls. The door leaves were indeed made of gilded bronze (or more probably of wood covered by bronze or golden plates), and they completed the rich ornamentation of the entrance portal. Gilding on the shafts of the columns and the capitals I do not consider as excluded, with the other monumental polychromy of the architecture, executed in stones of various colors. Painted external architecture, also adorned by colored terra cotta, is proved on Egyptian-Assyrian works.

But how all this was combined together in its own time and its general effect, the attempt at restoration by Perrot and Chipiez on the basis of the genuine finds does not produce a result free from objections.[1]

1. See Perrot and Chipiez. Histoire de l'Art dans l'Antiquite. Vol. 6. Pls. †, †9. The stauctual form of the relieving triangle is retained, a filling of this in the heraldic style has erred; but Chipiez found it necessary to fill the two adjacent slabs with walking lions, executed in the same style as in Susa. (Plate VI).

Not far from the Lions' Gate is to be found a second and quite similarly constructed Tomb of about 45.28 ft. lower diameter, according to Dörpfeld in Perrot and Chipiez. (Vol. 6, p. 642). The upper portion of the tomb (tholos) has fallen; the blocks lying on the ground permit the cutting of the joints a and the dressing of the different ashlars to be accurately seen; vestiges of a former metal covering of the interior do not re-

remain.(See Fig. 52; coursing of the stones of the vault).

The entrance portal between the walls of the passage (dromos), access to which was once closed by masonry, exhibits a treatment similar to the Tomb of Atreus; the great doorway with the enclosure in recessed bands, the projecting cornice and the r relieving triangle, only open externally. As novelties are added on the right and left and adjoining the walls of the passage smooth vertical projections, above them being strongly projecting plain abacuses, just as on the Tomb of Atreus, to correspond bases of half columns, likewise found in place, on which is wrought a fluted piece of the shaft 5.51 ins. high, so that in regard to the former existence of half columns flanking the portal, no doubt can exist. Thirteen shallow Doric flutes in good condition may still be counted. There was also found a fluted portion of a half column 4.23 ft. high, but which is not so well preserved and only permits the distances between the fillets to be recognized.with uncertainty, yet which may yet be measured on one, though this may also be found by calculation. It was likewise attempted here to construct from this a column larger upwards, that would give an upper diameter of 2.07 ft. for the column with a lower diameter of 1.28 ft. [1]

1. See my essay on this building with illustrations in K. K. Oest. Jahrb. Vienna. 1907. "Vormykenische und mykenische Architekturformen."

But the still preserved abacus of the width of the projections only shows 2.89 ft. in width, and a capital with even the modest projection as at the Tomb of Atreus would then still f find room beneath it, but not one corresponding to an assumed shaft of the column measuring 2.07 ft. at top. By this fact is assured here likewise the cylindrical shaft of the column, or one very slightly diminished downwards, and that the column thicker at top should be rejected.

New is further the form of the cornice abovv the doorway, a piece of which is still in place and exhibits the forms of the entablatures of Lycian rock-cut tombs. The disks of the projecting round logs are behind the abacus and the vertical projecting bands continue above them on the facade to the coping of the wall.

Instead of the facing with decorated colored stone slabs, there must have been plaster and painting, with which was also coated the shafts of the half columns made of porous limestone, while they were of greenish alabaster at the Tomb of Atreus. The question of the form of the facade in general must also be regarded as an open one for this monument.

Relating to the question of the shafts of the columns at the right and left of the doorways of the facades of both tombs, represented as disproportionately enlarged at top, I give the adjacent illustrations as a reply.(Fig. 53). There are now determined the places of bases of the shafts of the half columns, the arrangements for fixing these and marks on the masonry, the walls of the passage and the projecting slabs, beneath which were inserted the capitals of the columns, as well as the most valuable portion of a capital, that is also illustrated in Perrot and Chipiez from a photograph (Vol. 6. P. 8). The detail forms of these are determined with the execution of the transition member to the shaft. For this are assumed 2 or 3 annulets. Here is the only place where the imagination yet has play, all else being settled. If within the limits thus determined be drawn the corresponding shaft of the column, as attempted by me at a large scale, see what a noble result is produced! Certainly indeed it can not be obtained otherwise than as drawn, which according to either number of annulets only permits the cylindrical shaft or one very modestly enlarged upwards, as for the great stone columns of the 16 th Egyptian dynasty, by which the case now appears to be settled. The Eleusinian white marble torch holders mentioned (Fig. 54) were really steles, that once supported on their tops vases for offerings or consecrated gifts(according to the still remaining arrangements for fastening them, and they were not the supports of friezes or columns).

The Royal Tombs in Pantikapæon form a group of stone tombs, that have yet been little studied in a technical way, although some are in structural respects worthy of this in the highest degree. Built in courses of ashlars with thin lime beds, they are constructed over round and square ground plans and are covered by high domed roofs, whose vault lines are assured as be-

being curved or straight (as the generatrix of the conical surface). The vaults are "false", being formed by corbelling out the stone courses, where the projections also appear internally and are not dressed off to a uniform surface. As in Argolis, these are not detached structures, but they are buried beneath mounds of earth, and are made accessible by passages covered by stone slabs.

Their ceilings are constructed in the same manner as the vaults of the tomb chambers, the external surfaces of the ashlars of the vertical walls as well as the fronts of the corbelled stones exhibit bold bosses, like the ashlar masonry of Italian Renaissance palaces.

In comparison with those of Argolis, the chambers on a circular plan present structurally nothing new besides the stepped internal surfaces. Their vault line is a steep pointed arch, the vault stones are backed with dry masonry, and the vault itself is closed by a horizontal stone slab as in Mycenae, though with a reduced span.(21.33 instead of 49.21 ft.). It is otherwise with those on rectangular or square ground plans. Men would not here give up a high dome, and they were not satisfied by making but two sides curved, leaving the other two vertical, as at the Royal Tomb at Cnossos, no indeed -- they carried all four external walls vertically to a certain height and then vaulted obliquely from these the four surfaces of the ceiling, i.e., they placed a high square pyramid on the former as a ceiling. If changed into the curved form, they w would have had the cloister vault, but which the Roman-Augustan period first attempted. The visible stepping of the vault stones was retained, a conical inserted slab formed the termination, as sometimes shown on the indeed contemporary Etruscan tombs.

An entirely new structural problem meets us in the so-called royal kurgan (royal tumulus); to erect a conical vault over a square room, where the four angles of the substructure lie in the circumference of the circumscribed circle, the base of the cone. By the intersection of the vertical planes and the conical surface are produced four hyperbolic side arches, between whose springings (imposts) and vertexes extend four conical

pendentives joining in a circular base on which then rises the conical vault. The pendentives and the dome above them are constructed by corbelling out the courses -- which can only be of advantage for the former technically -- that likewise appear on the visible surface of the interior. The conical vault is closed by a plain stone slab, and thus it does not show the pure conical form to the apex, but cuts this off at the crown. (Fig. 55).

A conical sinking in the lower surface of the closing slab does not exist, like that executed at the Tomb of Atreus. The backing and earth covering is constructed in the same manner as in the other subterranean tombs mentioned. Just as in the Etruscan tombs near Orvieto, the acute angles, that must be produced by dressing off smooth the visible surfaces of the vault stones in the interior, are avoided -- these indeed only by cutting off the rectangular angles,-- and it was the s same technical idea, that permitted the master of Pantikapäon to leave the full angles in the interior and to reject such a beautifully smoothed uniform surface, like that in the Tomb of Atreus. Under heavy pressures of the stone rings, the danger of breaking off the angles was greater, when the corbelling was carried to the vertex, especially in the upper courses.(?).

The group of tombs in Pantikapäon must be placed in the 6 th or 5 th century B.C., thus at about the same time as were solved the same problem in Persia in the palace interiors of Sarbistan and Firouzabad in a different way. In Pantikapäon by conical pendentives, in the Persian palaces by trumpets. The former received their completion in the great Byzantine structure of S. Sophia about 1000 years later, but the latter remained during the entire western middle ages in control of the transition from the square substructure to the domed upper portion on a circular plan.

Near Mycenae are also to be mentioned four domed tombs on t the western and northwestern slopes of the hill, on which the city stood, whose vaults have fallen. A fifth -- thus being seven in all -- was likewise found in the vicinity of the general burial place of the city.

Of other domed tombs found in Greece, there may yet be ment-

mentioned those near Menidi, Oechomenos and Pharis near Amyclea, near the Heraion south of Mycenae and near Volo in Thessaly.

Pausanias mentions the Treasury of Minyas at Orchomenos, i.e, a domed structure there, as a remarkable work. "It is a circular structure, somewhat depressed-pointed at its apex; the topmost stone is said to hold the entire structure together," wh which was not exactly the case. Also placed at the foot of a hill, like the Tholos of Atreus, this wonderful domed tomb of antiquity, the Tholos in Orchomenos, is now half destroyed.It consisted of a large circular apartment, the dromos, and an adjacent rectangular chamber, which was built of green slate, the quarry for which has been located in the vicinity of Lebadeia. The dimensions of the entrance doorway were almost exactly the same as in Mycenae, and the diameter of the domed i interior is only 3.28 ft. less than there. Eight courses above the floor are entirely preserved and 12 are partially so. Above the 5 th course, almost every other stone shows preparations for fastening metallic decorations, which also extend over the architraves of the small sepulchral chamber.

1. Fig. 56 is reproduced from Schuchardt. Plate at p. 340.

The holes and bronze pins there form a continuous system of five points at which bronze rosettes may have been fixed.

The chamber was sunk downwards into the rock like a shaft; the walls were faced with masonry and the ceiling was formed of slate slabs 0.98 ft. thick resting thereon, which were decorated by a sculptured spiral pattern enclosed by a border of rosettes, and by an inserted central panel (Fig. 56 [2]). Likewise the walls were covered by finely ornamented slabs, but of marble.

2. Similar ceiling patterns in stucco with painting were a also found in the Palace at Gnossos (see Fig. 38, original d drawing from the copy in the British Museum in London), and others in the Palace at Tiryns. All are to be referred to Assyrian or Egyptian origin. See Grammar of Ornament by Owen Jones. London. 1856. Pls. 10, 11.

In Orchomenos were also found fragments of several paintings, that belong to the early Mycenaean stratum, made known by H. Bulle in his comprehensive publication; Orchomenos. I. Die Äl-

älteren Ansiedelungscchichten(Abhandlung der K. Bay. Akad. d. Wiss. I Kl. XXIV. II Abth. Munich. 1907). A piece 6.30 by 5.56 ins. is assumed to represent a building with windows, according to p. 72 of the text. Over a white transverse beam appear ends of round logs, on which again lies a transverse beam, above which is to be found the well known half rosette or palm ornament, painted on terra cotta or wall plaster, likewise carved in stone on the structures in Cnossos, Mycenae and Tiryns, where it frequently appears.(See Fig. 59, after the above work of H. Bulle. Pl. 28).

The vertical pillars are painted red and different blocks are separated from each other by reddish-brown or black bracket 1 lines. The chess-board pattern of the wall is black and white, the ends of the beams are alternately red and blue, and the palm-leaves are colored blue and white, as in Tiryns.

The domed Tomb discovered near Menidi [1] is built of courses of quarried limestone blocks, which are irregular, only being roughly dressed with the hammer, and they are set on each other without mortar, but well chinked with spalls. The diameter of the tholos is 27.5 ft. with an original height of 29.5 ft. But the entrance doorway is constructed of more carefully dressed stones of larger dimensions, and a peculiar mode of relieving the lintel was attempted by anchoring together the obliquely inclined walls by bond stones (Fig. 57), and this is to be considered. An allied construction is found in the Pyramid of Daschour for relieving the stone slab ceiling of the chamber of the tomb.(See Perrot-Chipiez, vol. 1, p. 227, 228. Fig. 58, taken from Fig. 152 there). A dromos 9.85 ft. wide and 91.0 ft. long leads to the entrance doorway, just as for the Tholos of Mycenae.

1. See Lolling, Bohn, Furtwängler and Kohler. Das Kuppelgrab bei Menidi. Kais. Deutsch Arch. Inst. in Athens. Tech. Theil. p. 45-47, pls. 1, 2. Athens. 1880.

The domed Tomb near Dimini,[1] located one hour from Volo, shows a round stone slab 4.72 ins. thick and 3.58 ft. diameter as the closing stone of the dome. The height of the interior amounted to 29.5 ft., its lower diameter being 27.89 ft. and the height of the entrance doorway 11.81 ft. Striking in the

domed tombs mentioned is the agreement in the proportions of the dimensions.

Homer gives for his heroes a still different kind of sepulchral monument; these are colossal mounds of earth, frequently on a stone substructure and intersected by dividing walls, the tumulus, such as still exists at Sardes on the sea of Gyges, and on the hill terrace of ancient Smyrna and in other places, as memorials visible at a great distance.

"But they mass the monument in a circle, lay the stone base around the fire, and heap up the shot earth into a hill."

Hector's bones were placed in a golden box in the hollow grave beneath the stone cairn and covered by the pile of earth. Patroclus' white bones were collected from the funeral pyre, placed in a golden urn between two layers of fat, and the mound was then thrown up; to Elpenor, "we heaped up a tomb, placed on its top a pillar, then fastened on high the finely polished oar." Telemachus also thought of piling up a memorial to his father on rocky Ithaca.

Another species of sepulchre of the heroic period was discovered by Schliemann near the walls of the citadel in the vicinity of the Gate of Lions at Mycenae, the so-called pit tombs. The narrow surface of the rock between the Cyclopean walls of the first and second enclosures of the citadel, which is steeply inclined, was covered with earth, leveled, and supported a double series of vertical stone slabs set in a circle and horizontally covered with stone slabs. This ring of stones is about 88.58 ft. in diameter, with a narrow entrance on the north; at its centre stood a series of sepulchral slabs, some of which are decorated by reliefs (4 sculptured and 5 plain were found, with a great many fragments of others). Beneath them and deep beneath the layer of earth were 5 sepulchral chambers of oblong form, cut in the solid rock, to which a sixth was later added, their average length and breadth being 19.69 and 9.84 ft. Within these were the skeletons of 12 men, 3 women and 2 children, lying on pebbles, among which numerous remains of food were to be found, all being covered by a layer of clay, pebbles and of earth.

The walls of the tombs were lined with small quarried stones and they were covered by slabs of shelly limestone, which rest-

rested on wooden beams, whose ends were covered and protected by shells of sheet copper. The edges of the shells were hammered together and fastened to the wood by means of copper nails.

Crowns and diadems of gold with stamped ornamentation lay on their heads, and golden masks covered the faces; golden shoulder belts, bronze swords with golden handles and inlaid work, rings, golden vessels, silver cups, head-bands, golden ornaments for greaves, beautiful wooden buttons overlaid with gold plates, bracelets, idols, copper kettles made of plates riveted together, ornaments of rock crystal and amber, an alabaster vase, an ostrich eggewith overlaid dolphins, Egyptian porcelain, etc., were near the dead, these objects now filling an entire hall of the rooms of the National Museum in Athens-- indeed one of the most interesting collections in the world. The ostrich egg and the porcelain indicate very ancient commercial relations between the inhabitants of the Argolic plains and Egypt; the golden masks point to Asiatic as well as Egyptian customs. The latter have already been found in Babylon (now in London), in Memphis (now in Paris), on the coasts of ancient Phoenicia, opposite the island of Aradus at Byblos, the city of the stonecutting Giblites, the supporters of the Phoenician ashlar style, the city of Zenobia on the Euphrates, in Kertch, in Olbia, and a bronze mask at Nola.

On these ornamental objects, the Phrygian style of decoration plays an important part, and all elements of assuredly Mycenaean pieces of decoration are shown in Asia Minor. [1]

1. *See Milchhöfer.*

Here should also be mentioned the ruins of the Pyramids of Cenchrea,[2] which are built of great polygonal blocks, partly with the use of mortar (the latter perhaps to be referred to a mediaeval restoration ?). The plan forms a rectangle of about 49.2 ft. long and 39.4 ft. wide; three sides are well preserved to a height of about 9.84 ft., while the fourth (western side) is greatly injured; at the eastern side is an entrance, through which one enters a narrow passage and from this the t true internal chamber, about 62.3 sq. ft. in area, which was originally divided into two rooms. Whether this almost unique

structure in Greece was a sepulchral and victory monument (the so-called polyandron) or a watchtower, or the like, is uncertain.

2. *See Lolling in Badaeker's Griechenland. P. 278. Leipzig. 1888.*

3. Building Materials and their uses, Tools for working them, Transportation, Setting, Scaffolds, Contracts for erection, Building Prices etc.

Before the technical treatment of the architectural works a and their details, acquaintance is to be made with the building materials, that the Greeks employed in their structures, as well as with the conditions under which this occurred.

Wood, stone, bricks and metal, so long as an architecture exists, have been the preferred materials for embodying the structural ideas of every people. The Grecian makes no exception thereto. A great part of the working tools have been the same from antiquity until now, or have remained similar; axe, hammer, toothed saw and plane for dressing wood, hammer and chisel, toothless saw and drill for working the different kinds of stone; melting, casting and drawing out for working metal.

For building woods were employed both forest and fruit trees, and Pliny in his Natural History (Caius Plinius Secundus, Hast. Nat.), in the 14 th, 15 th and 16 th books, for example, chiefly writes of 13 kinds of oak trees. Cork oaks from the country of Elis were prized for making wagons, and winter oaks for shingles for roofs. Many of the later mentioned trees are treated in evidence of their occurrence in Greece and of what is said of them there:-- beech, cedar, pine, fir, larch, linden, elm, poplar, alder, sycamore, yew, ash (mentioned in Homer as the shaft of Achilles' spear), chestnut, maple, box and olive.

Their characteristics as building woods are mentioned, and their usability for certain purposes was emphasized, for example, for cabinet-making. Of fruit trees, there are cherry, plum, apple, pear, walnut, mulberry etc. [1]

1. *Technologie und Terminologie der Gewerbe und Künste bei Griechen und Römern by Hogo Blümner. II. P. 245 et seq. Leipzig. 1879.*

In the 33 rd book are mentioned of the metals, gold and silver, and in the 34 th, iron lead and copper, and of bronzes, Corinthian, Delian, Éginetan and Campanian.

In the 36 th book are described the kinds of stone, sawing them with the toothless saw and Ethiopean sand, with gems in the 37 th.

For the great series of the architectural works described by him in Hellas, Pausanias designates porous and crystalline limestone as the structural materials; Eleusinian, Pentelican and Parian marble for the monuments of Athens, inland limestone tufa for the Temple of Zeus in Olympia, tufa for the terrace in the Altis there. For the Temple of Athene in Pellene is b briefly mentioned inland stone; the enclosing walls of Ambrosos were of black inland stone; the buildings of Bassae, Mantinea and Tegea were famous for the beauty and jointing of the s stones; in Megara was mentioned as peculiar an unusually white shelly marble, which was softer than other marble. For the T Temple of Artemis at Ephesus the neighboring quarry of Corressos supplied the splendid white marble material, and for the buildings in Syracuse the Latomia within the limits of the city furnished an excellent light gray porous limestone. In Akragas, Selinus and Egesta, a yellow porous limestone came into use, that was well suited to permanently receivv a stucco coating, and which could be laid up in blocks of any dimensions.

Of the kinds of stone chiefly employed in the Grecian mother country, the following are to be mentioned.

1. The bluish-gray dense limestone, frequently veined with yellow to reddish-brown, iron-colored cabcareous spar, from the quarries of Lycabettos, from the Areopagus, the Hills of the Nymphs and of the Museion, was more commonly used in the earlier period before the Persian war.(Pelasgian walls,and foundations of the old Temple of Athena on the acropolis of Athens).

2. The Kara limestone from the vicinity of Athens, a light white porous limestone, colored red or reddish in spots by iron nodules, frequently similar to travertine, was sawn into ashlars.(Foundations of the old Temple of Athena and of the Parthenon of Cimon).

3. The limestone from Acte (Aktites lithos) at Piraeus, of yellowish-cray to yellow color, a fresh fracture beind white to light-gray, was chiefly used for foundations, but for the superstructure as well, as shown by the Odeon of Herodes Atticus and the Theatre of Dionysos.

4. Conglomerate stone, a kind of breccia, with white frac-

fracture, easily cut and sawn; mostly employed only in the middle of walls.

5. The compact limestone from Eleusis, of dark gray or b brownish color, was mostly used only for certain parts of buildings, sometimes merely for decorativv purposes on account of its color, at others for technical reasons by reason of its hardness.(Uppermost step of the stairway of the Propyleion in Athens; window sills in the sace structure; frieze of the Erechtheion).

6. The lower white and the upper blue-gray Pentelican marble from the quarries above the demos of Pentele were employed as a building stone for great public buildings, especially during the time of Pericles.(Olympeion, Propyleion, Temple of Nike, Parthenon, Erectheion).

7. The lower white and the upper blue-gray marble from Hymettos were more used durigg the period of Roman supremacy.

8. The coarse-grained island marble from Paros and Naxos was relatiwely little employed in Athens.(Roof tiles in Olympia; relief frieze of the Theseion).

9. The upper and lower white Attic marble was quarried and used near Laurium and Sunion.

10. The gray, yellowish and red compact limestone of the chalk system and the limestone conglomerate in the ciccuit of the plain of Argos were especially employed for the prehistoric structures in Mycenae and Tiryns.

11. The light bluish-gray and also the yellowish-gray marble from Doliana were used on the Temples in Tegea, Phigaleia, and also in Olympia.

12. The tertiary shelly calcareous sinter limestone was easily wrought while fresh and was sawn into ashlars; most buildings in Olympia (Temple of Zeus, Heraion, Palaestra etc.) were built of it, as well as the Temple in Corinth.

There were further employed for building purposes:-

13. The marble from the valley of Cinus near Sparta.

14. The marble from Atrax in Thessaly.

15. The marble from Carystos and southern Euboea, the so-c called Cipollino. This with the red and black marbles were also chiefly employed for certain parts of buildings, preferably

during the Roman imperial period, for example for the shafts of the so-called Stoa of Hadrian, and for the Exedra of Herodes Atticus in Olympia.[1]

1. See Lepsius. Griechische Marmorstudien. From the Abth. d. K. Preuss. Akad. d. Wiss. Berlin. 1890. P. 11-51, 114-133. Also Gottgetreu, G. Ueber die antike Marmorsorten, ihr Vorkommen und ihre Verwendung im Altertum. Zeit. f. Bauw. 1883. P. 103-132. Also Durm, J. Ueber die naturliche Färbung des Marmors an den Bauten der Acropolis in Athen. Athens. 1871. P. 471. Lastly, Becke, F. In Min. und Petrog. Mitt. Edited by S. Tschermak. New series. (1879). P. 57.

Taken generally, ashlar construction can already be proved in Athens after the 7 th century. Ordinary limestone and porous stone were employed on the buildings before the Persian wars, both for the foundations and the superstructure; to which was added breccia in the 6 th and 5 th centuries. At the same time was Parian marble utilized for the decoration of the buildings, as proved by cornices of structures, that belong to the time preceding the Persian invasion. Besides different kinds of island marbles, the Pentelican was most regarded.[1] With the beginning of the domination of marble, men employed the inferior materials chiefly for substructures alone or for backing walls.Parthenon, Erectheion, Propyleion). Still they were not entirely abandoned for facades. Theodore Wiegand[2] prefers to understand as porous stone (Poros) ordinary porous tertiary freshwater limestone -- tufa limestone -- of yellowish or whitish color, as that called by the ancients "poros" or "lithos porinos." The porous material used on the acropolis of Athens came from the peninsula of Akte, wherefore it was also designated as"Piraeus limestone." Also probably from the vicinity of Athens came a hard reddish limestone, where such a stone is still quarried on Hymettos near Kara, but which cannot be termed "porous", although usually so called. All structures on the acropolis built of ordinary limestone, it is customary to comprise under the name of "poros" architecture.[3]

1 See Dr. Walther Judeich. Topographie von Athen. P. S. 11. Munich. 1905.

2. See Th. Wiegand. Die archaische Poros-Architektur des A-

Akropolis zu Athen. P. 59 etc. Cassel and Leipzig. 1904.

3. See Th. Wiegand.

of dense Parian marble are the pediment groups, metopes, cornices of the enlarged ancient Temple of Athena on the acropolis, as well as the pediment groups of the Parthenon.

Of Pentelican marble were made not only certain architectural members but even the entire superstructure, evidence of which is afforded by the older and the later Parthenon, the Erectheion, the little Temple of Athena Nike, the Propyleion, the Theseion, the monument of Lysicrates, and the Temple of Zeus Olympios. After the end of the 5 th century, and especially in t the 4 th and 3 rd was employed another sort, the dense bluish-gray upper Hymettos marble for architectural structures. (Asklepion, Theatre Dionysos, Stoas of Eumenes and of Attalos). At the end of the 6th and the beginning of the 5 th centuries was used in some parts of buildings even the dense bluish-black limestone of Eleusis (Eleusinian marble), for example, for the window sills of the Propyleion and as a frieze on the Erectheion. On the same structure was therefore employed marble and ordinary limestone, differing both in color and hardness. De Dense white (marble) and porous limestone are found together in the metopes of Selinus; thus also on the Temple of Zeus at Olympia the metopes of the cell wall are of marble and those of the portico are of "poros." As a prominent example of the use of mixed materials may serve the Temple of Apollo at Delphi, according to Herodotus (V, 62), and then a number of Hellenistic structures, as for example, the Artemesion at Lusoi. The sequence is then generally breccia, porous limestone, and then Hymettos stone.

But of the Delphian Temple it is said:- - Thus they (the Alkmaeonides) built the temple more beautifully than was the design, for among other things, although they were only required to construct the temple of tufa, yet they built the "front side" of Parian stone. For uniformity of appearance, the tufa facades must have been covered by stucco.

H. Pomtow presents in his essay on tests of stone of the buildings at Delphi and of the consecrated gifts , both valuable and interesting contributions to the knowledge of the materials

of Grecian stone architecture. Besides the three kinds of Delphic-Epichloric stone, Parnassos stone, conglomerate and white S. Elias stone, Pomtow had 160 samples of stone determined by R. Lepsius in Darmstadt and has published the results.(1906). The "Parnassos stone" was especially employed for walls, foundations, terraces and substructures, but was little used for the masonry of the superstructure. It easily cracks and splits, weathers rapidly and assumes a brownish-red color. Like the golden yellow patina of the Attic marble structures, this is explained by the iron particles existing in the limestone; "if by the weathering of the surface the lime be dissolved by rain water and carried away, then the iron contained therein is changed into brown iron ore (hydrated iron oxide)." The deceased geologist Professor Knop in Carlsruhe on the contrary, in his time designated a lichen as the cause of the coloring (See Parthenon), that did not grow on the southern stone surfaces of the monuments (on account of the sea winds) and thus left the marble white, but which thrived on the eastern and western sides and produced the characteristic golden tone, but it soon died on the northern and left there a gray local tone. The coloring of the stone surfaces on the Parthenon would now correspond to this explanation. But Lepsius insists that the stone on the east and west sides of the Parthenon must contain more iron, than that employed on the north and south sides.

The proper building stone of Delphic light gray S. Elias limestone, bluish gray and nearly white, of uniform color and chiefly without veins and cracks. Dense, hard and with sharp angles, it does not flake off and only weathers with difficulty. For example, of it are composed the floor slabs and the stylobate of the great Temple of Apollo. From the end of the 6 th century, this stone remains the principal material of all Delphic buildings, and that does not assume the weathered color of the Parnassos stone. Only a few blocks of it become rose red.

Of the conglomerate stone, or more correctly of breccia, (limestone slate) were foundations and stone walls constructed from the end of the 5 th century.

From the fine-grained porous oolitic limestone of the quarry

near gorinth were the columns of the Temple there obtained, a and of the same material were also those of the Temple of Apollo at Delphi.

In order to protect from the penetration of rain water and from weathering, all stone surfaces and architectural members were coated with lime plaster, that is in part preserved; a p procedure, that was likewise retained on the buildings of the Altis at Olympia, at Syracuse, at Paestum, on Egina, at Metapontum, Selinus, Akragas etc.

As a summary, Pomtow distinguishes 6 kinds of ("poros") porous limestone (p. 269-271), 3 kinds of ordinary limestone and 5 sorts of marble in Delphi. A list of the Delphian monuments from which were taken stone specimens for determination and t their origin is given on p. 273-286 by Pomtow-Lepsius.

Bricks, airdried and burned, have remained in use from the earliest times; Of airdried bricks were built the upper walls of the private houses, even a portion of the city wall of Themistocles in Athens, while brick as a structural material in the Grecian mother country chiefly belongs first to the Roman imperial period.(See further what was said of Gournia, Section 3).

Clay roof tiles were replaced by marble tiles in the 6 th c century, but on the contrary, clay pipes were employed as water conduits during all periods.

For walls of sundried bricks, the external surfaces were protected by stucco. Examples of this are the city walls of Eleusis and of Athens; mentions of the burning of the bricks do n not occur in the corresponding building accounts.

With the clay was mixed chopped straw. Charges for this as well as for calves' hair, clay, fine and coarse sand, and stone spalls exist. But nowhere in the ancient period are to be found payments for slaked lime, since the cut stones were held together by wooden or metal cramps, and the airdried bricks w were joined by clay mortar.

Less as a building material in masonry, but rather as a protecting coating of the external surfaces, or as a ground for mural and ceiling paintings in the interior, was employed burned lime, mixed with water and sand or pounded clay potsherds.

In place of carbonate of lime also occurred the sulphate -- gypsum (gypsos). That most suitable for structural purposes was brought from Cyprus. Pulverized and mixed with water, stirred to a paste with wooden sticks, it served for preparing the "white-coating" (opus albinum) for covering the walls in the interiors of buildings as well as for relief decorations and sculptures. Its use was limited in Greece [1] to temples a and public buildings, but it was not used in private buildings in the earlier period. In the Italian colonies it occurs in the 2 nd century B.C. and generally, when men commenced to decorate the walls of private houses.

1. See H. Blümner. Technologie und Terminologie der Gewerbe und Künste bei Griechen und Römern. Vols. 1 and 2. Leipzig. 1 1875-1879.

Clay as a building material or for producing a level bed in rough masonry is proved on the structures of the heroic period; for a coating, it remained in all times a desirable material.

Bronze, later iron, and bronze again with the use of cast lead was employed in masonry only for increasing its stability and strength, but otherwise only for making tools and sculptures.

Likewise among the Greeks was gold the metal earliest wrought; it was followed by copper, and that by bronze, when forging p preceded casting. Bronze was an important article among the Greeks.

Lead, like tin, was known to Homer; iron was not as frequently mentioned by him as copper. He was also acquainted with wrought iron and steel.[2]

2. See Dr. L. Beck. Die Geschichte des Eisens. 1. Abth. Brunswick. 1884.

Both in thinness and in clean casting did Grecian bronze founders attain the highest success.

The kinds and special forms of tools for masonry, for dressing stone and wood from the most ancient times to the present day remained approximately the same, only the material of which they were made changed, and the hardest iron and steel were preferred and became exclusive.

A representation of such is given by the illustrations of the

corresponding finds in Gournia, those collected in Most Egyptian museums, which were models for the Greeks, as well as the stonecutters' tools found in Sicily (Fig. 60) and see the Section on tools for working metal, wood and stone in Blümner. II. P. 193-233.

The Greeks were acquainted with machines, which served for setting stones:-

a. The plumb line (paidelos), a piece of lead or bronze on a cord -- an invention of Daedalus.

b. The level (diabetes), whose invention is ascribed to Theodoros of Samos.

c. The bevel (gonia), made of iron or of wood. [1]

1. See also Dictionnaire des Antiquites Grecques et Romaines by C. Daremberg and E. Saglio. 3 rd edition. Paris.1881 - .

On a good road, men drove a wagon in 1 3/4 hours from Castelvetrano to the stone quarry of the inhabitants of Selinus, the Cave di Campobello, which still affords to us conclusions relating to the mode of quarrying shafts of columns and ashlars f for the temples of Selinus.

The shafts were not cut from loosened prismatic blocks there, but the high drums were cut out round in the solid rock and smoothed on the external surface with reference to their diminution. Narrow circular passages, 1.97 to 2.62 ft. wide, were cut around each shaft, in which the stonecutter must undertake the preparation and dressing with the pick. As if in isolated cells, separated only by thin walls cut parallel to the diminished shafts of the columns, there yet stand the drums still fast to the solid rock; they have diameters of 10.17 to 10.76 ft. with a height of 12.63 ft. Only after this preparation, which was justified by the vast dimensions of the blocks and the resulting difficulty of moving them, were they detached from the rock, when first at the bottom a groove 0.69 ft. wide and 1.31 ft. deep was cut around the shaft, that was followed by its detachment.(Fig. 62).

Dressed and loosened drums lie ready for removal in the vicinity of the blocks still fast in place. These mighty blocks of stone must have been taken about 7 1/2 miles over a hilly country to the site of the building.

For obtaining ashlars for walls, the ledge was laid bare vertically from 3.28 to 19.69 ft. The upper surface was dressed off level; grooves 5.91 to 7.09 ins. wide were cut, that detached ashlars 4.92 × 3.94 ft. and 1.97 ft. high.

Judging from the external walls of the Propyleion in Athens, where entirely constructed of ashlars, the procedure must have been the same. The final finish was given after the setting of the ashlars. In obtaining great blocks, men appear to have proceeded in ancient times in the same manner as at Campobello.

First the rough dressing of the blocks in the stone quarry itself, afterwards their separation from the solid rock. Thus likewise for the colossal ashlars in Baalbec, where three sides were first dressed, before the loosening from the rock occurred. On the route from Pentelikon to the ancient marble quarries may still be recognized in part the ancient slides, at which may be noted the arrangements for lessening the fall of descending blocks, as well as some abandoned drums of columns.

Puchstein in his work on the Grecian temples in lower Italy and Sicily (P. 123), says that on the columns of the Temple of Apollo near Selinus may be seen all phases of the gradual preparation. They may have been the following:- the drums were first roughly cut in circular form, but the beds were already carefully dressed; for more convenient transportation and perhaps for raising (setting), there remained on the external surface 4 strong bosses directly opposite each other (projecting 7.87 ins. and 16.54 ins. wide), as shown by unused and unfinished drums on the acropolis at Athens. They were set on each other in this condition (as exhibited by the incomplete temples in Egesta and Sardes), the flutes being only cut for a certain length on the lowest and uppermost drums as guides, and they were generally chiseled off only after the construction was finished.

Koldewey and Puchstein further state concerning this on p. 123:- "Most columns are thus built of drums of different heights (about 7 in number) as they come from the quarry, and as those not entirely detached from the rock now stand in the quarries of Rocca di cusa, dressed in round form with attention to the diminution. For this circular surface is then

assumed first the division into 20 parts for the flutes and the surface is cut in as many sides, thus being the columns on the southern front and in most of those on the western side. Then secondly the angles of the prism are removed, perhaps accurately to the depth at which the edges between the flutes should appear, for example on the two columns of the opisthodome, and thirdly the flutes are hollowed out in round form, but only to leave the "working inch" on the finally intended surface, for example on column O, second from the north, and fourthly this working inch is also removed from the flutes, so that the column appears completely fluted, like the northeast column." These observations entirely agree with my own, made on the spot.

The loading and transportation of the blocks to the site of the building required further methods in many cases, that were not always of the simplest kind. Transportation might be effected by inclined planes (causeways), sledges or drags, wagons and ships, the latter when foreign material was to be provided.

An inclined plane or the construction of a causeway of the largest kind in order to procure building stones was indeed the causeway to the Pyramid of Cheops, whose construction required ten years. Egyptian and Assyrian reliefs (See A. H. Layard. Discoveries in the ruins of Nineveh and Babylon. London. 1853) afford to us information concerning the transportation of massive ashlars, prepared in the quarry, to the site of the building.

Fastened on wooden sledges, they were drawn by men, also being moved on wooden rollers by the use of levers, when the block was made immovable on the sledge by roping it.(See Fig. 62 from Choisy, L'Art be Batir chez les Egyptiens. 1904. P. 118, 135.).

Of the transportation from the quarry to the building site, Vitruvius (Book X, 2) says in relation to the drums of the columns and the architraves of the second Temple of Artemis at Ephesus, that the architects Chersiphron and Metagenes proceeded in a reasonable manner, since they did not trust to transportation by wagons, on account of the great weights and the softness of the roads. "They combined four wooden timbers,

whose thickness equaled a third of their height, into a frame corresponding to the magnitude of the stone. On each end of the shafts of the columns were fastened iron double dovetail plates and pins, set with cast lead. In the wooden timbers of the frame were inserted corresponding iron rings in which the pins turned. The frames were also strengthened by bands of ox leather. The turning of the pins in the rings was entirely unobstructed, so that the shafts were drawn by yoked oxen and rolled forward with the pins turning in the rings." This procedure was also applied to the transportation of the architraves." They had constructed wheels of about 12 ft. diameter and enclosed the two ends of the architrave in the middle of the wheels; in like manner were the pins let into the ends of the entablature blocks on the one hand, on the other into the rings. With the practical explanation of this procedure the great architect of the Louvre, Perralut, formerly occupied himself, later Hittorf, and in the most recent times K Koldewey and Puchstein also. These gentlemen have but slightly adhered to the simple statement. Hittorf fastens the architrave within a cylinder of iron rods and places the wheels at a distance from the ends. He rejects the dovetail plates. C Certainly greater security against bursting the stone was afforded when only pins were used. Koldewey and Puchstein desire the method of Metagenes to have been applied to moderately large Sicilian temples of limestone, according to arrangements f found there by them (p. 120), by which they place the wooden wheels distant from the ends, like Hittorf, and form a connection between the stone and the wheels by 2 × 8 = 16 wooden wedges. In the square holes for the pins, they place metal bars with cylindrical ends, as shown by the certainly later bronze pins from Baalbec.(Fig. 83).

At the Temple mentioned in Ephesus (see Forschungen in Ephesos, published by Oest. Arch. Inst. I. 1906. p. 223), the axial distances of the facade are from 20.21 to 28.78 ft. and th those of the longer sides amount to 17.15 ft. The diameters of the columns may be taken at approximately 4.92 ft. I assume that the architrave was also 4.92 ft. wide, and according to other structures in lower Italy, Sicily, Greece and Asia

Minor, that it consisted of 2 to 3 blocks in width and was only composed of a single block in quite small buildings (Figs. 64, 65; see the construction at the Parthenon, at Olympia, Paestum, and many other places), when the diameters of the columns did not exceed 1.97 to 2.30 ft. The lengths of the architrave varied in greater structures, for example, from dimensions of 14.76 ft. on the Temple of Poseidon at Paestum, 15.15 ft. at Selinus, 14.11 ft. on Egina, to 17.81 ft. for the middle passage of the Propyleion at Athens, and 14.17 ft. on the Parthenon. On the other hand, ceiling beams are found 21.33 ft. long, for example, at the Erectheion. In Ephesus only the architrave block ovvv whe middle intercolumniation of the pediment facade exceeded the usual dimensions, being 28.71 ft. But all were again surpassed by the magnitudes of the ceiling beams of the hypostyle hall in Karnak with 29.53 ft. from joint to joint. Thus the maximum of a loaded stone architrave or of a stone beam was not attained in Ephesus. Yet Egypt had long been open to the Greeks at the time of the erection of the Hellenistic Temple in Ephesus.

The columns were likewise in Ephesus built of separate drums. The lowest one of the "columnae caelata" was adorned by figures,and it was about 6.89 ft. high and 5.91 ft. in diameter, including the projections of the figures. That those above it exceeded this dimension of 6.89 ft. is not to be assumed, according to other structures (Priene, Sardes, Samos, Miletus, of 15 drums), while indeed in the very much later Temple in Aizani the columns were monolithic and 27.84 ft. high. As before stated, the blocks were only roughly cut in the quarry; thus men needed to pay no attention to any injuries to the angles or surfaces; the problem was only to bring them whole to the building site.

To transport the drums, which were as high as wide, and that contained about 282.54 cubic ft.(17.64 tons), presented no difficulties. They were scarcely furnished with iron pins and c could be more simply moved, on wooden rollers, for example.Further consideration was only required by the circumstance, if the plain drums exceed twice or thrice the dimensions of 6.56 ft., but which was not the case for the lowest one. Our assump-

assumption must relate to the succeeding ones, if Vitruvius be correct. The dimensions of the architraves are given by the arrangement of the columns in plan. Blocks up to 28.71 ft. w were required, for which 4.92 ft. was the height and 1.64 or 2.46 ft. the width, according to whether 2 or 3 pieces were taken for the width. These long and thin blocks, weighing over 19.84 tons, that were fastened in wheels 11.81 ft. diameter, on account of their shape (Fig. 64), scarcely endured any movement of the vehicle, and a shock would cause a fear of breaking in pieces the stone to be transported. Men resorted to t the method described by Vitruvius, then combined the architrave in one block (at least 4.92 × 4.92 ft. in section), but this can no longer be proved.

An idea of the arrangement can be obtained from the rollers, with Vitruvius, with which were leveled the walks in the palaestra; but our witness means for this, that the apparatus only succeeded well for short distances (800 ft.) and in a level country.(Fig. 66). But Vitruvius also describes an unlucky attempt of Paionios to bring from the quarry an immense block. (11.81 × 7.89 × 5.91 ft.). Paionios desired to excel Metagenes and fixed the ends of blocks in wheels with diameters of 14.76 ft. and connected these together by wooden timbers. About the drum thus constructed, he wound a rope, but pulling on this m merely unwound it and did not move the stone forward. "The wheels indeed rolled, but he could not move the load along the right way."

How the architraves and drums of columns were brought down from Pentelikon and taken to the acropolis of Athens is not stated. Sledges, rollers, levers, pulleys, wedges, drags and inclined planes must indeed have done this.

For carrying up ashlar walls men must have employed pole and trestle scaffolds, as they are sufficiently represented on Egyptian and Roman releefs.(Fig. 67).

For temples the cell walls were certainly first carried up to the height of the ceiling entablature. Since no great weight was to be supported by the stone courses, men might employ light poles or timbers bound together, which were divided into stories. The connection of these together was by plates or l

longitudinal poles. The stones could be brought up by laborers, and also by lifts, that were likewise employed in setting up the drums of the columns. The strong cell wall also facilitated the scaffold for the columns. Fig. 68 is based on a draw- by J. L. Hittorf, plates 8, 9 and III of the work; "Recueil d des monuments de Segeste et Selinonte," measured and drawn by J. L. Hittorf and L. Zanth. Paris. 1870. The general arrangement of the scaffold and of the hoisting machine for the erection of a Grecian temple. See also Chapter 4, page 525 et seq., in the text volume; "mechanical means that served to transport materials from the quarry to the site of the work and to hoist them into place".Also see A. Choisy, Histoire de l'Architecture. I. P. 273.

Vvtruvius (Book X, 2) supplies abundant information concerning the hoisting machines. One such working with 3 rollers is termed trispastos (three-ways), and the pentapastos had five. According to the weight of the stones was employed the windlass, the axle with a rope drum, the winch (windlass on the ground) or the treadmill.(Fig. 69).

Another kind of hoisting machine was merely constructed of a scaffold pole stayed by four guy ropes, and to it were attached the corresponding pulleys. Three lines of men could haul on this without a windlass and quickly raise the load. The machine was called polypastos (many ways), since the rope passed through many rollers, thus affording easy and quick handling. It was also used for loading vessels.(Cranes; Fig. 70).

A peculiar arrangement for pulling and setting is shown by the cell wall and floor slabs of the Heraion in Olympia, where these are perforated and have holes on the upper surface. The same arrangement is likewise shown by the oldest architectural remains on the acropolis of Athens, which are built into the north enclosing wall. It is also found there on one of the old poros capitals (northeast angle) and on capitals at the T Temple of Aphia on Egina. [1] At the Heraion we also find perforations on the stylobate steps, extending from the bed to the tread; it is assumed that these served for fastening the animals for sacrifice. Similar perforations are likewise found on the angles of the casemate piers in the fortress of Eurya-

Euryalos in Syracuse, that certainly served for fastening horses.

1. *J. Hittorf already called attention to these arrangements (pl. 89, p. 309 et seq.) and he also mentions them on a capital from the interior of the Temple on Egina.*

Perforations were indeed the earliest means for setting stones; after these probably come the U-shaped grooves and only then the lewis of three pieces, that of two pieces, and the tongs.(Figs. 70, 71).

According to the works at Olympia (II, p. 43), at the Treasury of Sicyon are assumed to have been used also the tongs (F (Fig. 70) for raising small blocks, besides the perforations. At the great Temple in Akragas the lower beds of the blocks of the capital (measuring 11.58 × 8.53 × 5.58 ft.) have two grooves (Fig. 72) in which were placed square iron bars, whose ends were joined by rope slings passed through the iron S, attached to the rope of the pulleys and thus hoisted.

Pliny (Hist. Nat. 36, Book 21) terms it a chief wonder, that for the Temple at Ephesus the architraves of such great weight could be hoisted so high, almost 55.78 ft. in this case.

The architect accomplished this by baskets full of sand, that he piled up to above the capitals, then gradually emptying the lowest ones, so that the dressed blocks slowly settled to their places. This was most difficult for the lintel of the doorway, which had the greatest weight. It did not at first succeed, the artist was in anguish and desired to kill himself. Artemis decided him while asleep to not do this, for she would arrange the matter. It was all in order in the morning; it appeared that the lintel had set itself correctly by its own weight. T The immortals are no longer so kind now to the much troubled and overburdened practitioner. But the engineers of the Alexandrian period, excelling in the construction of war machines, were not so backward as to have employed sand heaps 65.62 ft. high to raise the architrave blocks in question!

A Choisy objects, in describing the structural methods of the Egyptians (Hist. de l'Arch. I. P. 35) with reference to t the hints given in the papyrus Chabas concerning the use of sand, and he adds that the sacks of sand are indeed still in

use today for removing the centering of arches. He gives the following representation of the process.(Fig. 73). At A the architrave lies on rollers, at B. these are replaced by sacks of sand, at C the architrave is in its proper position.

The only thing that gives occasion for thought is the top of the colossal bank of sand. If we assume in its place a well constructed wooden inclined plane, this would perhaps be more correct.(Fig. 73 [1]).

1. According to the facts described, like the former great sufferer Odysseus, I consider with a doubting mind, whether at the time of the climax of mechanics in classic antiquity, men really worked on banks of sand instead of wooden scaffolds, and fastened shafts of columns and architraves crosswise in wheels, thus being able to transport them to the site of the building. From the time and the circumstances, I must myself decide for "no."

Architraves 29.53 ft. long, with the enclosing framework and with a road for the ox team and drivers in a single series, require a road 36.00 to 39.37 ft. wide. To construct and maintain such is costly. Transportation in a single series would further be very slow. The description in Vitruvius and Pliny is indeed based only on hearsay, or what is still more probable, is reproduced as misunderstood. I believe in the wheels, but the ancients would indeed have connected them in pairs at definite distances behind each other, as still done in the transportation of great logs from the forest, or of dressed timbers (ceiling beams and roof timbers) from the carpenter's yard to the building site, or of long iron members. A narrow road suffices, the stone beams might be laid on the axles between the wheels in pairs, or be suspended from them by ropes, whereby jolts on the uneven road could not injure the freely suspended stones.(Fig. 75).

For the time required in the process, it may be stated according to Strabo, Book XIV, Chapter 1, 21:- "Chersiphron first built the Temple of Artemis, which was later enlarged by another. But when a certain Herostratos burned this, they built another more beautiful, for they collected the ornaments of t the women and likewise sold the old columns. Evidences for

this are the decisions of the people made them. Alexander the Great, who offered aid (he wished to bear the costs of the building already spent and to be paid later) was rejected with the words:- "It is not seemly that a god should build temples to the gods." But after the completion of the Temple, which Artemidoros calls a work of Deinocrates (court architect of Alexander), it procured the temple ornaments by an honorary title of the architect, who still fitted the altar almost entirely with the works of Praxiteles. The old Temple was begun in 620, completed in 540 B.C., and destroyed by Herostratus in 356 B.C.; in 334 Alexander was in Asia Minor, his kingdom was divided in 323, Lysimachus assumed the royal title in 306, and at the command of the king, Deinocrates rebuilt the temple in the Ionic style more splendidly -- perhaps better said, "built anew." Then must also one of the greatest Grecian sculptors -- Scopas -- have been busied with the execution of one or more of the "columnae caelatae," which was only possible, if his fell not in the years 420-417, but very much later. If the rebuilding of the Temple in Tegea be ascribed to him, in place of the one burned in 395 B.C., then must Scopas have been already an artist of renown. How old must he have been indeed, if one supposes that the figure ornament on the Temple in Ephesus was only the last work on the temple? Also if one assumes that the rebuilding was begun soon after the fire, then must Scopas have just commenced his work at the accession of Lysimachus, thus at the beginning of the 3 rd century. Archimedes (who is also designated as the inventor of the pulley) was born in 287 B.C., he had indeed completed his university studies in 267, and without a preliminary training, he would have scarcely attained to his mathematical and mechanical results, he might be only a greater pupil of a greater teacher. and he was indeed not a youth, when he listened to his colleagues and they carried out the idea of their ancestors in transportation and no longer refused building scaffolds. They further, as generally assumed, were without steam and electricity, only having the help of human arms and the strength of horses.

Yet a word on transportation by water and by land of the colossal stone blocks -- the obelisks -- in Egypt. Pliny (Hist.

Nat. Book 36, 14)anticipates by his description the principle, that the transportation and erection of even the small obelisks was a far greater work than "the quarrying and cutting."

With what energy the erection was executed, Pliny again supplies evidence:- king Ramses himself bound his son to the apex of one, to inspire the master of the work, since he feared that the machines might not suffice for the load, and thereby proving the safety of the stone to the laborers, also for the benefit of the stone. 120,000 men were engaged in this work.How the machines mentioned were constructed is unknown. The architect Satyrus transported an obelisk on boats from Phoenix to Callixenus, when he carried a canal from the Nile to the obelisk, and loaded two broad built boats with small blocks of t the same stone, until the doubled volume made twice its weight, so that their ends were forced under the obelisk resting on t the bank, then were the stones thrown out and the boats rose and received the load. The obelisk was set on 6 cubes, and the architect was rewarded with $5000. A. Choisy (Egypte-procedes; Hist. de l'Arch.) indeed correctly understands the method, when in Fig. 23 B, p. 36, he couples together the two boats by beams and suspends the stone from them.(Fig. 76). The stone them lay in the water, thereby losing about 1/3 its weight. T Therefore the Egyptians, long before Archimedes, utilized the principle, that every substance loses weight in water.

From the first site of the obelisk mentioned in Arsinoe, the prefect Maximus transferred it to the Forum, whereby resulted further difficulties in its transportation by sea (Alexandria-Puteoli-Ostia-up the Tiber), but which were overcome without further trouble. The transport vessel everywhere aroused the greatest astonishment, yet we learn nothing of its construction. Did it perhaps consist of floating connected vessels w with the stone under water? For the manner in which modern times manages such transportation, see the transfer of the so-called Cleopatra's needle by water from Alexandria to London.

Of the treadmill mentioned on page 98, the well known marble relief in the Lateran Museum affords a representation.(Fig. 69). The relief indeed belongs to the postaugustan period, yet we should not forget, that the "Graeculi" (little Greeks) of Roman

architecture rendered service. The lifting beam with pulleys, the traveler, the wheel and its men, besides the men pulling ropes -- nothing is forgotten in the interesting representation of the work, not even the branches on its top.

For the Temple built of tufa on Delos, the tiles were brought from Syros and cost 15 cents per pair, exclusive of freight and duty; with these they came to rather more than 18 cents. Clay (airdried) bricks were 1 ft. long and 1/2 foot wide, costing $7.20 per thousand; of which $6.48 was for making and 72 cents for value of materials. A Corinthian tile cost there at the factory 15 cents and 18 cents delivered in Athens. The ordinary tiles made elsewhere had the same price as the Corinthian, exclusive of the cost of transportation. [1]

1. An obolus equaled one sixth of a drachme or was 3 cents.

Up to $14.40 was paid per cubic foot of cedar wood; elm wood varied in price between $1.44 and $3.60, as well as ash wood.

The day's wage for a laborer, who boarded himself, amounted to from 27 to 36 cents, and even 45 cents. It exceptionally fell as low as from 18 to 22 1/2 cents.

According to the building accounts preserved, the building woods employed in various Attic buildings were cedar, elm, ash and cypress. Olive wood was also used for dowells. (For example, in the walls of Athens). They were largely brought from Macedonia, but the greater part was purchased in Corinth in the form of sills, beams, posts, pillars, piles, plates or rails, boards and thicker planks. The wooden dowells and anchors were externally coated with tar, as well as the woodwork of the roof and the joiner's work. The latter was also varnished with a resin. (Mastic varnish ?).

The timbers for building usually had large dimensions, for example, the ridge-beam of the Erectheion, which was 20 ins. wide and 23 1/2 ins. deep at the side (thus not to the top line), as may be deduced from the recessed apex stone of the pediment, lying on the acropolis. According to the contract for constructing the Arsenal near Zea, architraves 30 ins. wide and 27 ins. high were required, with planks and boards 6 ins. wide and 3/4 to 1 1/2 ins. thick.

Specifications for the erection of buildings were thorough

and frequently circumstantial, takink into account all possibilities.

Against lazy contractors, the officials in charge of the building always reserved the right to carry it on under their own management, if the former did not fulfil the requirements of their contract.

Proof for this statement may be found in the following specifications for work for the Temple of Zeus at Lebadea in Boetia, which date from the beginning of the 2 nd century B.C. It was found in the year 1875, cut on a marble tablet 6.07 ft.high, 3.12 ft. wide and 8 ins. thick, filling two columns side by side, with 94 lines and 8500 letters.

This was first submitted to scientific criticism by Fabricius in the essay "De Architecture Graeca commentationes epigraphicae."(Berlin. 1881). It was first made known to professional circles by Centralblatt der Bauverwaltung.(1882, p. 5, 11). Choisy, the well known French writer on architecture, treated the same subject under the title of "Un Devis de Travaux Publics a Livadia.(Paris. 1884).

We give a verbatim translation from Fabricius as follows:-

1. (If the contractor fails to complete any part of the work undertaken by him, then will the building commission for the Temple afterwards omit this portion). The contractor then has to repay to the building commission for the Temple (the money paid him in advance) and the fifth part of the entire sum, for which he has undertaken the execution of his part of the entire works. (This money), together with any extra costs, and with the amount of the penalty imposed on him, shall all be collected from the contractor and his bondsmen by the building commission for the Temple. If this cannot be done, then shall their names be posted on the "white board." --- We,(the building commission for the Temple) award all metal work, and of stone work, the making of the slabs for inscriptions and of the caps at the same prices; but he (the contractor) shall make the foundation bases as extra work. For the limestone ashlars, he shall receive the fixed price of 90 cents each, for as many as he delivers, and for the cutting and painting of the letters, $3.69 per 1000 letters. --- But after he has received the ad-

advance payment, the contractor shall forthwith (commence and) execute the work within 10 days, by engaging therefor at least 5 skilful workmen as assistants. But if he fails to perform any stipulation made in the contract, or is convicted of an error, then shall he be as severely punished by the building commission as he appears to deserve, for not performing the contract stipulations; and if one of his assistants be convicted of an error, he shall be discharged from the work and be no 1 longer permitted to assist; but if he be disobedient, then shall both he and the contractor be punished. --- If it be found advantageous during the work to change any of the prescribed dimensions by increasing or diminishing them, then shall he execute it in accordance with our directions.---

--- But the original bondsmen and the (first) contractor shall not be discharged from their obligations, until he, who has undertaken the work awarded the second time, shall have furnished sufficiently safe bondsmen. For all works previously executed, the original bondsmen shall be responsible to the last recourse. The contractor shall in nowise injure works now in the sacred precincts. But if he should injure anything, then shall he make it good again at his own cost, during a time to be fixed by the building commission for the Temple. And if the first contractor, who has charge of the setting, spoils a stone, then shall he furnish instead another perfect stone at his own cost, without delaying the work. He must remove the spoiled stone from the sacred precincts within five days; if he fails to do so, the stone will then belong to the sanctuary. But if he furnishes no substitute and does not make good the injury to the building, the building commission for the Temple will also deduct this. The cost thereof and one-half more (additional) shall be paid by the contractor and his bondsmen. If a stone breaks in two of itself, then the contractor in charge of the setting shall receive no punishment on account of this stone. --- If the contractors disagree in regard to one of the written stipulations, then after the members of the building commission for the Temple have been sworn, they shall decide the (matter) on the spot. More than one-half their number must then be present. Their decision shall be legal. --- If

the building commission stop the contractor from delivering t the stone, they shall make good to him the time for which they delay him.--- After the contractor has given bondsmen according to the law, he shall receive the first payment on account for the portion of all inscription slabs undertaken by him, and f for the caps lying thereon, when he deposits the tenth part of the entire (sum as security). After he has shown that all (slabs and caps) are completed, are true on all sides, finished according to the contract and set with lead, to the satisfaction of the building commission and the architect, then shall he receive the second payment on account for all letters of t the inscription, according to the fixed price and according to the number computed on the basis of the original, when he likewise deposits the tenth part of this(sum). Finally, after he has completed the entire work, and after this is accepted, he shall receive the tenth that was deposited. Also for all limestone ashlars set by him, as well as for all letters cut by him afterwards, he shall receive the fixed price together with the tenth, unless some deduction be made as a penalty.-- If any extra work be required for the benefit of the building, he shall execute it at the same rate, and shall receive what is coming to him therefor, after he has shown that it is good. --- If it happens that the excavation be not firm, he shall then pave it with as many limestone slabs as are necessary, a and he shall likewise receive what is due him therefor, together with the tenth. --- But he shall also place 11 caps on the inscription slabs already existing, after he has cut the slabs on top, and has extended the existing scaffold as we direct. He shall remove the iron cramps already let into the slabs, when they project and hinder the cutting, and after deeper holes have been drilled, he shall reset them and cast them properly with lead. He shall further insert in these(11 caps) keyed dowells and cramps and cast them in with lead, and he shall finish everything as already described above. --- We award also these caps, those 6 ft. long and 5 ft. long to be at the same price the others cost; those 3 ft. long, 4 in number, we will count each two as a single cap. --- He will likewise receive payment on account for these caps, when he has shown that

the inscription slabs are cut, set and cast in with lead, and that the caps placed on them are clamped above. He shall also receive payment for these, after depositing one tenth, exactly as stipulated above.--- After he has joined together the caps, and has shown that they are true, set with lead and complete, are clamped on top and range perfectly with each other, then shall he wash the inscription slabs with soda, clean and wash the letters, for so long as we require. — But everything else, not mentioned in this agreement, shall be done according to the law and to the(general)ordinance for building the Temple.

2. After the contractor, who by means of (open) tender of the building commission for the Temple, has undertaken to prepare and set the pavement slabs along the long side for the Temple of Zeus the "King", and for the external passage around the cell on the side toward the south, to be of hard Lebadean stone, 12 in number, corresponding in size, breadth, and thickness to the pavement slabs already finished and set along the long side, beside which these are to be set,--- then after the contractor has delivered the rough stones, uninjured, near the Temple, and they have been found good and in accordance with the prescribed dimensions, he shall first dress the under sides of all stones tru and out of wind, without defects and truly plane; and with a sharp anf fine tooth chisel, he shall dress all parts, which are to rest on the sills, and (those parts set on the filling) between the sills, for a width of at least two feet from the front edge joint; but the middle portion still uncut is to be dressed with a coarse tooth chisel, and he is to make everything true to a straight-edge, at least as long as the stone to be cut, and not less than 6 fingers thick and 6 inches high. Then he is to chisel away from the under sides of all pavement slabs that portion, which lies above the filling, from the rear edge joint for the given length and width, dressing the cut surfaces true as particularly specified for the under side, thereby producing an open space between the dressed surface and the filling, not more than a little finger in depth. --- But he shall likewise dress all the rear edge joints of the pavement slabs entirely true, straight and not curved, without defects, plumb, perfect by

square, accurately cut, and indeed for the width of at least 9 fingers on the three margins with a smooth, sharp, broad chisel, carefully applying the red chalk test, but shall cut the yet untouched middle portion with the coarse tooth chisel, and he shall (then) undercut all the rear edge joints as at a door,(using therefor) a stone straightedge and carefully making the red chalk test, not without correcting all straightedges by the (stone standard) straightedge preserved in the sacred precincts, as often as we direct. He shall likewise cut the (front) ledge joints of the pavement slabs already in place, against which he is to set (the new ones), after he has stretched the line on the upper surface straight from the left, both in the portico, as well as along the longer side, and after he has drawn the line in presence of the architect, he shall cut away the existing allowance for cutting with the mallet (and chisel), thus producing the given width, and making everything true and with sharp angles. He shall further true up the upper edge of all the pavement slabs, 13 in number, already set, by means of a straightedge 20 ft. long, 6 fingers thick and 6 inches high, and shall test them with red chalk, using a smooth and sharp wide chisel therefor, and shall make everything straight, without defects and quite true, for a width of at least(9)fingers. (He shal dress this flat margin) after he has first cut guage spots near the joints on each stone, true with the square and the stretched line, according to which the dressing is done. In the same manner shall he work to the line (stretched) in the portico. Then shall he undercut the edge joints of the pavement slabs already set, against which he is to set (the new ones), as at doors, and to fit the stone straightedge, exactly as specified for rear edge joints. --- Before he sets the stones, he must dress the sills and the filling stones on the upper surface, using the sharp fine tooth chisel on the sills, but a blunt chisel on the filling, corresponding to the finished and set (parts), and he shall show that everything necessary has been dressed. --- Then he shall set the pavement slabs according to directions, commencing to set them at the left, as will be indicated to him; each stone against an edge joint, setting a wedge between them, so that it

accurately fits on top against the finished and set slabs.And he shall use pure oil and Sinope red chalk for all straightedges. If he does not use Sinope red chalk and pure oil, then shall he be punished by the building commission for the Temple and the Bőotarchs; neither shall he set the stones permanently, until he has proved to the building commission for the Temple, that he has used good Sinope red chalk and pure oil.- -- He must show the dressing and jointing (of the slabs) to the architect, and the edge joints and under sides of all stones to the assistant architect, while they are being moved; (he shall indeed) rub the under sides with olivv wree sap,and as soon as(the stones) are correctly set, neither bruised nor in wind, (but rather) faultless, nothing scattered beneath them, and they fit against each other accurately, while he in the dressing cuts away the (high places) of the portions to be dressed with a fine tooth chisel made sharp, so far as they rest on the sills, or with a blunt chisel, where they rest on the filling; but he shall rub the edge joints with pure oil and use a smooth broad chisel made sharp. When the work is finished and the joints have been washed with soda and rinsed off with pure water, he shall fasten (the stones). The insertion of dowells, cramps, and double-dovetails, as well as their weight, and all setting in lead, shall be proved to the building commission for the Temple by the contractor personally; he sh shall not set anything permanently without this proof. But if (in spite of this) he does set anything, then must he raise it up again and set it anew; he shall then be punished by the bu building commission for the Temple and the Bőotarchs as severely as he appears to have deserved, had he not executed the provisions of the contract; and if one of his workmen be convicted of an error, he shall be discharged from the work and no longer be permitted to labor thereon; but if he be disobedient, then shall both he and the contractor be punished, and he (may) set no stone with lead, before he has fulfilled the prescribed decision. --- If it proves advantageous to the work to make a any of the given dimensions greater or smaller, he shall do this in accordance with our orders. --- As soon as he has set all the pavement slabs beside each other, he shall dress the

upper surface in the same manner as the bearing and finished ones, and true it off according to the great straightedge, using red chalk and the tooth chisel, (first) cutting borders around the stones, and with a level extending them outwards from the guide spots existing on the pavement slabs, after he has prepared for this cubes of dry wood from the wild olive tree. And as soon as he has shown that everything is straight, entirely true ------.

We deduce from the inscription found on Delos, that during the erection of a building, the building ground was enclosed by a wall of airdried bricks, and that the average salary of an architect per year of 12 months was$129.60, which was likewise paid to the foremen of the work. Homolle therefore wishes to understand by "architect" not the designing artist, but rather the superintendent. ("He is an artisan rather than an artist, a mere superintendent.").

The well known Lex Puteolana,[1] the contract for building a covered gateway to Puteoli, instructs us concerning the construction of a wooden projecting roof and its covering of tiles, whose lowest course was to be fastened by iron nails; the contract for the repair of the city walls of Athens afforded information relating to a kind of roof sheathing and a layer of straw and earth, the detailed description of the work for the Arsenal in Piraeus informs us about a simple roof, with t the support of the roof timbers by stone piers, and all dimensions and spans of timbers, together with the doubled sheathing of the roof and the coating of clay on this, the building contract of Lebadea gives the conditions of the agreement, the inscriptions of Delos and Epidauros describe the various kinds of materials, the places of origin of building materials, the construction of wooden coffered ceilings, the gilding of lilies and rosettes in the coffers, the ornamentation of framed doors with ivory, the glueing of wooden parts, the protecting coating of the same, the tarring of the roof tiles, the public letting of the work at the lowest price, and the wages of the workmen and the superintendent; the inscriptions of the Erectheion inform us concerning the erection of the marble frieze, the construction of the ceiling of the cell of Athene Polias,

the roof of the cell of Erectheios, the various painters and sculptors' work; others give facts relating to similar monuments in Eleusis, Troezene, Tegea, Corcyra, Eretria, Lesbos, Piraeus and other places.

In the preface to his tenth book, Vitruvius also speaks of the unpleasant chapter from exceeding the estimates of cost; then he states, that in the well known and great Grecian city of Ephesus, "there was indeed introduced in the early period of their ancestors a truly severe and yet not unjust law," according to which the architect must make an estimate of the cost on assuming the superintendence of a state building, for which he and his property were held responsible until the completion of the structure. If the cost corresponded to his estimate, then he was distinguished by commendatory decrees, even for the case in which the cost did not exceed the estimate by more than one fourth. This excess was added to the total estimate, paid from state funds, and nothing further occurred. But if the cost exceeded the preliminary estimate more, then the sum required to complete the work was taken from the means of the architect. He closes the tale with the wish, that the immortal gods would also bestow on the Roman people such a law for public and private buildings, so that fellows without technical training could not practice their unwise acts unpunished.

The wish is old and evvr young, and it will continue. The Ephesians do not speak of the effect of the law.

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2. Wiegand, Th. Die Puteolanische Bauinschrift, technically explained. (Reprint from XX Supplement Vol. of Jahrbücher für Phililogie). Leipzig. 1894.

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IV. FOUNDATIONS, CURVATURE OF HORIZONTALS, RISING MASONRY, DETACHED SUPPORTS, ENTABLATURES, CORNICES, CEILING AND ROOF, THEIR JOINTING AND CONSTRUCTION.

Securing the Ground and Foundation Walls.

If a building were to be erected on ground saturated with water, then men sought by special technical means to make this able to support the load.

Pliny [1] describes such a procedure at the Artemesion at Ephesus. This was first to be ensured against earthquakes and the formation of cracks in the earth; therefore a marshy site was chosen, but this again had other defects of a different kind as a result. Men did not dare to place such a heavy load directly on such an insecure building site and to sink the foundations into it, such as was produced by a temple 425 ft. long and 225 ft. wide, with columns 60 ft. high. Therefore it was prepared to receive the masonry by spreading broken charcoal in the trenches for the foundations, over which were laid sheepskins with their wool -. thus resorting to a layer of charcoal as a support.

1. Pliny. Nat. Hist. Book 36. 21.

Men had recourse [2] to a layer of sand between sheet pilings or protecting walls in order to improve the ground beneath it, for the Temple of Athena Ilias in Troja, that dates from the Hellenistic period. This was made about 8.89 ft. deep and 8.53 to 11.81 ft. wide, above which rose the narrower stone foundations to a height of 16.40 ft. The protecting arrangements were to prevent the fall of the walls of the trench by the s spreading of the sand, which was deposited in different layers and tamped. (Fig. 77). These were constructed of vertical w wooden posts 5.91 ins. square, driven at distances of 1.48 ft., and whose vestiges are still to be recognized, the open spaces between the posts being partly filled with small stones.

2. See Dörpfeld, W. Troja und Ilion. Athens. 1902. p. 219, 220, where it is stated, that this kind of foundation was often employed in antiquity, as for example, at the Treasury of Sybaris in Olympia.

"The ashlar foundation was removed by stone pillagers even to the last stone" ;; this remains problematical but possible.

Pile foundations for Grecian buildings are unknown to me, while they are not unusual for Roman structures.[1]

Note 1. Besides well known structures in the german tributary provinces (Zehntland), see Vitruvius, Book 2, 10; the alder "which is driven in close piling in marly countries beneath foundation walls, supports immense loads of masonry and d does not decay. This may be seen in Ravenna in partcular, where all public and private buildings havv piles beneath their foundation walls." Also see pile structures in prehistoric times.

To ensure against the effect of earthquakes, men sought protection in Ephesus by selecting marshy ground or low places as a building site for vast public structures. Egyptian engineers met these difficulties by structural means, when they brought into use ground arches in the foundations. [2]

Note 2. See Perrot & Chipiez' Aegypten, p.535, 538, where are givvy the passages taken by them from Prisse d'Avennes, Viollet-le-Duc and Mariette, where attention is called to the fact, that likewise Alberti and other Renaissance masters refer to the use of ground arches in a variable building soil.

Viollet-le-Duc gives an attractive investigation of the reason of this construction intended against earthquakes, and there results from it the necessity for diminishing the mass of the building upwards and for curving downwards the beds of the stone courses. The cube stands firm on a horizontal base, but the block B falls, when the ground line a b is raised, and which is not the case for a pyramidal body. But the courses may be loosened at the angle e.

In order to prevent a separation, he desires the courses to be curved downward.(Fig. 78 [3]).

Note 3. Viollet-le-Duc. Histoire de l'Habitation Humaine. p. 84-88. Paris.

A. Choisy states[4], that it is required by his opinion of a good construction of a wall, to level the courses; but the Egyptians departed from this principle, when they built the enclosing walls of Karnak, El Kab, Dendera, Phile and Ombo. He rejects a construction against earthquakes and determines, that for buildings on hills the walls do not exhibit a wavy

coursing of the stones, and that such are only found on the banks of rivers or where the ground is permeated by water. The "undulating" coursing is therefore not produced by changes in the ground beneath, since it is found in foundations on the solid rock.(Plate 1; Figs 79 to 82).

Note 4. L'Art de Batir chez les Egyptiens. p. 21 et seq. and Plate 1. Paris. 1904.

The "undulations" of the coursing should oppose the sliding of the stones and was favored,especially in the buildings of the 18 th dynasty.(1597 B.C.).

Earthquakes and ground water might produce similar disturbances in foundation and wall masonry; we still protect ourselves today against the latter by ground arches and inverted v-vaults.

We find again recurrences of these Egyptian precautions in the earthquake region of Delphi in the great terrace walls of the sacred precinct and of the Marmaria. The slipping of the stones was prevented indeed by the wavy beds, the stone courses were not moved along straight horizontal lines, but in continuous wavy lines (Fig. 83), which are so carefully and well executed otherwise. To make possible a fine jointing, the wavy surfaces are cut smooth to a width of 1.58 ins. for a length of ashlars up to 5.74 ft., a height up to 4.76 ft. and widths of 0.98, 1.48, 1.64 and 1.80 ft., or even more, f for not all can be measured. On the eastern side the often strongly undulated stones are forced out of line as much as 3.54 ins.!

Dr. H. Pomtow [1] believes, that the visible faces of these ashlars at Delphi, which may at best be compared with the disjointed shapes of the pictures of the so-called patience games for children, were only wrought smooth after setting, which is more than improbable on account of the mode of dressing the angles. Yet there would not be excluded a subsequent finer dressingof the surface, especially when inscriptions were to be added to it, as the case on the ashlar walls of t the third city.(See Fig. 83, and for the mode of adding the inscription, the example near Agios Dheka on Crete). The Delphic wall was built in the 6 th century B.C., and for an

extent of 295.28 ft. is preserved to a height of 9.84 ft.[2] G. Perrot says on p. 329:- "All the lines forming this jointing are wavy with the most capricious bendings. This preference for the curved line complicates the work of cutting. Does it give to the whole greater resistance? I know not." The reply would be, that slipping is made more difficult.

1. Beiträge zur Topographie von Delphi. By Dr. H. Pomtow. Berlin. 1889.

2. Recently it is also dated later and mentioned as a technical art work of a later period.

Indeed to protect the Sanctuary of Apollo from the attacks of elemental forces in the earth's interior, the foundations of the Temple have been constructed in a way, that leaves scarcely anything to be desired in solidity and care. Standing on the solid rock, there is arranged for the porticos and vestibules a system of ashlar piers intersecting at right angles, which makes possible a great pressure of all walls on the ground and the laying of the floor slabs of bluish limestone, 6.78 ft. (also 6.95) long × 5.60 ft. wide and 1.28 ft. thick, which are all again connected together by iron I-cramps set in cast lead. (Fig. 85). A masterpiece of ancient construction, that nevertheless was disjointed by the force of the elements and the lust of men for destruction.

A similar network of intersecting walls in the ground is s shown by the foundations of the Altar in Pergamon. The building site of 112.20 × 120.74 ft. is divided into cells 10.82 × 8.20 ft., whose walls supported the floor slabs and the superstructure. The ashlars are of softer stone, joined without cramps and dowells, the cells being filled with earth and stone spalls. Its preservation till this time proves the goodness of the system and of the work. (Fig. 86 [1]).

1. See Altertümer von Pergamon. Der grosse Altar, der obere Markt. By Jacob Schrammen. Vol. 1. Plate 3. Perspective of the foundations. Berlin. 1906.

In certain cases it must occur, that the entire rectangular area occupied by the ground plan of the temple, which for most Hellenic temples presented the solid rock, was laid up in courses of regularly cut limestone ashlars, bonded but without

mortar; there the excavation for the buidimg was not planned, but the foundations in accordance with the natural position of the good ground were carried to different depths, for example, so that those of the Patthenon at the northeast angle rest directly on the solid rock, while on the south side may be counted 9 foundation courses of ashlars averaging 1.64 ft. high; at the southwest corner are even 22 courses, and on the west side are 5 of varying heights and composed of different materials; on poros ashlars 1.87 ft. high there succeed courses of poros and marble 0.95 and 0.92 ft. high. Courses of headers and stretchers alternate upwards, also headers and stretchers in the same course. The faces in the lower courses are only roughly dressed with imperfect jointing; in the upper courses they have the drafted margins and bosses or flat panels with rather complex arrangements for setting at the joints.(Fig. 87; the bosses under the flat panels indeed served for using the lever or crowbar for moving them closer and were to be cut off later). The foundation masonry on the west side projects but an inch or so beyond the step of the stylobate, while toward the south it projects about 4.92 ft. Otherwise the foundations correspond to the course of the walls of the superstructure.

For the pronaos of the Temple at Phigaleia, the continuous layers of uniform masonry are abandoned; piers of ashlar masonry are constructed instead at certain points, the intervals between these being filled with rubble masonry (Fig. 88).(Emplekton of Vitruvius and Diamikton of Pliny).

Foundation masonry of unequal depths is also employed at t the Heraion at Olympia, this also being on a varying site.The Temple partly rests on hard sand, partly on soft river sand. While the eastern portico has no foundation besides a sub--threshold, the foundations increase towards the east to a depth of 8.53 ft. with a width of 12.07 ft. The courses of ashlars in the foundations are not flush, but project irregularly beyond each other and widen downwards. For example, the course beneath the stylobate is narrower than it, while the next course is again wider. Both in this monument and in the Olympeion there, as well as on the Fountain-Sanctuary at Cadacchio,

the foundation of the colonnade is separate from the foundation of the cell, the latter merely consisting of a few (1 or 2) courses of ashlars sunk in the ground in accordance with Egyptian custom, which did not employ foundations in courses.

In a temple constructed of noble materials, the masonry of the foundation does not usually consist of the same, but of a less expensive material (see the Parthenon and Theseion), while in those built of poros limestone, the same kind of st stone is used in the substructure as in the superstructure. (See Temple of Zeus at Olympia, the Sicilian temples etc.). The foundation walls do not always rest on firm ground, they are not always placed on the rock; we likewise find them sunk in low and swampy places, as in Magnesia on Meander, on Samos, in Ephesus,-- in the latter place so that the building might not be affected by earthquakes, and that cracks in the earth might not be feared. (According to Pliny's Nat. Hist.36,21).

Very carelessly constructed foundations of detritus and of stone spalls are shown by a Treasury in the Altis at Olympia, (Fig. 89), and the projections at the locations of the columns in the interior of the Heraion there (Fig. 90). But this foundation in the latter plays a subordinate part, since thick slabs are laid over the mass of spalls and have a secure bearing on the continuous foundations of the internal columns and those of the wall of the cell. Descriptions of the foundations of this really oldest of Grecian temples with a mixed s system of construction are givvn in the work on Olympia[1], and Fig. 91 shows those of the Metroon in Olympia, by which the mode of execution is most clearly explained.

Note 1. Die Funde von Olympia. Edition in one volume, published by the Directory of the excavations at Olympia. Berlin. 1881. p. 32-35; plates 34, 36.

At the Temple at Lokri, the lowest courses of stones rest on a layer of blue clay 3.94 ins. thick, which projects beyond the stones. The foundations of the diffent parts of the building are carried to different depths, and the layer of blue clay accordingly lies at various depths. [1]

Note 1. See Mitth. des Kaiser. Deutsch Inst. Röm. Abt. Vol. 5. Rome. 1890. p. 177-201.

The foundations of Treasury VII in Olympia were placed on a heap of sand, and others are on brook pebbles.

Fixed starting points in regard to the foundations of circular buildings are given by Fig. 92 (Philippeion in Olympia, Tholos in Epidauros) and by the Arsionoeion on Samothrace.The three outer annular walls in Epidauros support the external colonnade, the wall of the cell, and the internal colonnade. The three inner annular walls served to support the foundation slabs. (See Fig. 93; perspective of the foundations at Epidauros drawn from nature.[2]).

Note 2. I assume them as supports of the pavement slabs. Pomtow informs us in his Delphica (p. 71. Leipzig. 1909), that Thiersch holds that the so-called canals (sic) of the so-caled labyrinth found under the pavement (what have these concentric walls to do with the labyrinth) to have been cavities f for strengthening the sound in a domed music tholos. That is barbarous!!

In the foundation of the circular structure of the Arsinoeion on Samothrace, constructed of tertiary sandstone, the two lower courses show no holes for cramps; the succeeding ones have them, as uell as the surrounding projecting marble border, while the courses resting thereon exhibit none. The cramps themselves are wanting. On the sandstone foundation rose the marble structure.

At a Treasury in Olympia, the stones are held together by double dovetail cramps, just as this was observed and cited on the wall of the Altis at the base of the hill Kronion.[1]-- At the Temple of Qeus there, the cell walls rest on through ashlar slabs, that are held together by iron I-cramps set in cast lead. The pavement of the external and the internal portocos have through ashlars, which receive the pebble floor a and the coating of cement.

The foundation of the statue of the god is treated in a peculiar manner. Grooves were cut in the poros stones and pieces of compact white limestone were inserted in these grooves, on which were laid the joints of the thick bluish pavement slabs (Fig. 94), which rest on drafts and were connected together by I-cramps. The mode of jointing and fitting the marble floor around the internal columns is likewise interesting.

(Fig. 95).

At the Temple in Messa on Lesbos, the foundations consist of the four enclosing walls, two longitudinal and two transverse, which together form a network of 9 rectangles. The two middle rectangles on the ends are filled by a complete foundation of the same kind, which probably does not extend as deeply as those of the principal walls. In the six external rectangles along the sides, a similar continuous foundation begins with the course of the lowest step, so that the courses of the steps of the temple, the crepis, form a compact whole, with the exception of the interior of the cell. The spaces within the rectangles formed by the foundation walls a re filled carefully with spalls of the same material, which c consists of black trachyte-tufa.

The substructure of the Temple of Athena at Priene rests in great part on the solid rock and only in the southwest on a foundation over 6.56 ft. deep, carefully built of large marble ashlars, in the construction of which the same procedure was retained as for the southern foundations of the Parthenon.[1]

1. See Athen. Mitt. 17. 1892. p. 161; also Ergebnisse der Ausgrabungen und Untersuchungen in Priene in the years 1895-8. By Th. Wiegand & H. Schrader. Berlin. 1904.

The foundation ashlars are not set to a plane and vertical; the northwest angle of the stylobate, thus the portion of the foundation placed on the rock, has sunk considerably --Ap-apparently on "account of the numerous cracks and holes extending through the rock, and not as a result of insecure construction." The leveling course has a drafted margin 2.76 ins. wide, the lower step is set about 2.76 ins. back from this edge, thus being a systematic widening of the foundation beyond the wall masonry.(See Fig. 96).

These different kinds of foundations, the quality of their execution, earthquakes, changes in the building site, and great depredations on the body of the structure cannot occur without influence upon their statical condition and external appearance, and therefore we must not examine with a critical eye and judge what now remains to us, laying down a scale, as if the works were now fresh from the hands of the architect.

Irregularities in the coursing of the horizontal portions of the structure, in the foundation masonry, the plinth and steps, as well as in the overlying walls and columns exist and are confirmed without dispute on the Heraion at Olympia, on the Parthenon and Theseion at Athens, on the Temples in Corinth, Egesta, Paestum, Pergamon, Priene and elsewhere. Likewise at the Temple of Apollo at Delphi, that exhibits a better preservation on the south side, the ashlars of the substructure for the olumns and the cell are recessed about 1.18 ft., and "undulations" have also occurred in the horizontal line. Of a "curvature" for optical reasons on their Temple, the Delphian architects indeed knew little, and the technical advantages, already shown to them 1000 years earlier, they did not accept, excepting for their terrace masonry, and there without any higher intelligence, but only by hearsay.

If the curvatures on the temples mentioned were directed do downward, they would have a meaning as they now appear, but would rather cause damage than benefit by accidents from the elements -- and they are worthless to the observer, worthless on account of the inadequacy of their execution and the smallness of their amount, as for example in Egesta a drop of 1.58 inch in a length of about 197 ft. for the building, all this being below a horizontal!

Concerning the nature of these curvatures of the courses of the stylobate and of the superstructure on a portion of Grecian monumental buildings, the following may be said.

The same feeling that required the entasis of the columns may have made a curvature of all horizontal lines on the building necessary. A passage of Vitruvius (Book III, Chap. 4), which relates to an arrangement on Roman Ionic temples was applied to the differently treated Grecian buildings, and made the most of for the benefit of the preceding principle.

"But if a podium is to be made around the temple on three s sides instead of the steps, it must then be arranged with reference to this, that the massive foundation, the stylobate, the body of the building, the main cornice and the cymatium, may be in accord with the podium itself, which is beneath the bases of the columns. The podium must be so leveled as to re-

ceive an elevation along the middle by oblique supports (scamilli impares); for if its surface were made absolutely horizontal, it would then appear concave or trough-shaped to the eye. But how the substructure and the little supports are to be made to correspond to this will be further treated at the end of the Book", -- though this promised explanation has been entirely lost. Hence this passage of Vitruvius, by its want of clearness and its incompleteness, has repeatedly and especially in the last decades given occasion for multifarious researches, discussions and interpretations.

The makers of sketches and measurements in the 18 th century took no notice whatever of this expression of feeling and of the hints of Vitruvius. First after the emanicpation of Greece from the Turkish yoke, when the ruins of antique temples became more accessible, commenced the more accurate researches on the ancient monuments; these were first due to the assiduous German architects, who were employed in Athens under King Otho.

Essays already appeared in the Allgemeine Bauzeitung in the year 1823 [1] written by Hoffer, then architect of the Greek government, in which it was stated, that the entablature of the Parthenon was not horizontal, but that the architrave appeared to be lowered at both angles, while all vertical joints still remained close. The same occurred at the Theseion, where all curved lines were parallel to each other, their rise amounting to from 1.57 to 1.96 inches for spans of 104.17 and 44.98 ft. Besides this curvature, there existed another directed towards the temple, whose versed sine was also 1.96 inches.

Note 1. Hoffer, J. Das Parthenon zu Athen, measured anew in its principal parts. A contribution to the theory of construction of the temple by the Greeks. Allg.Bauz.1838.p.371,5 579, 387.

Reports by the Englishman Pennethorne containing the same opinions appeared in the year 1846-7, and in 1851 were published accurate measurements by Penrose of the Parthenon, the Propyleion, and the Theseion. In the very meretorious work by t the latter are recorded all defects in workmanship, injuries and faults in construction and the deformations, which the st-

structures have suffered in the course of 25 centuries; since they form the nucleus of the publication, the existing curves of the stylobate and of the architrave on the Parthenon and Theseion are treated with especial predilection. [1]

Note 1. The level survey of the east and west sides of the Parthenon undertaken by the author in the year 1879, agrees in general results with that of Penrose. It exhibits the similar high rise of the courses and particularly shows what is most important, that the four angles of the stylobate do not lie in the same horizontal plane. (Fig. 97).

The southeast and southwest angles, which are stated by Penrose to be higher than the northwest and northeast angles, were so found, although according to the author, those halves of the courses extending from the middle to the southeast and southwest angles are somewhat flatter.

The curve is divided in two parts in reference to a horizontal (since their origins do not lie at the same height) has t the maximum rise of 3.15 and 3.46 ins. for a chord length of 101.5 ft. and a manimum rise of 1.65 and 1.10 inches.

The existence of the curved lines on the buildings and parts of buildings mentioned is a matter of fact; the statements given have been doubted by none of the later investigators, who have entered into the question whether this curvature was originally intended, or was caused by inadequate construction, or in time by means of accidents.

On the foundations or the substructure of several steps, on the columns and colonnades, on the triglyphs and metopes, one is reminded of the foundations of the Parthenon carried to different depths, of their construction with different materials, partly capable of slight resistance, of the unequal pressures of the coursed steps of the superstructure, of the positions of the columns on two blocks of stone, of their different heights, distances between axes and inclinations, of the metopes and triglyphs not equal among themselves, to which are added numerous other small irregularities, as for example, the circumstance, that the regulas and drops are not always placed exactly beneath the triglyphs, that the abacuses of the capitals do not have the same size, often varying in width about

3.53 ins. (6.83 to 6.54 ft.), and such different forms of echinus are exhibited, also that drops and pieces of mouldings are found cemented in, that the four angle columns are not of equal height etc.

The defects were certainly but very small, and scarcely another building of ashlar masonry in the world, of ancient or modern times, may exhibit as few faults and slight defects in construction as the technically perfected Parthenon, though affected by the imperfections of human powers. Let one but compare in this way the construction of the best structures of the Roman, or even of the Renaissance period. Yet these small faults are avoided with difficulty and do not lessen the worth of the building; it would be erroneous to rate this lower on their account, but it would be equally erroneous to explain these faults as being particular refinements, to discover them, and conceive that their explanation was lost to us.

But besides these small original irregularities, there also occur other deformations arising in later times, and demolitions of the most varied kinds. In the course of more than 2000 years, the building has served for the most dissimilar purposes, for the pagan house of a deity, for a Christian church, and for a Turkish mosque.

The marble ceiling of the opisthodome fell in the year 1408; in 1687 a bomb from Morosini's besieging troops fell in the Parthenon, in which the Turks had stored their powder, and exploded this, shaking the structure to the foundations and scattering the blocks of marble as far as the Museum hill. Elgin and Lusieri pillaged the triglyph-frieze in 1801-1803, destroying the cornice; the building had to endure a violent bombardment in 1826-1827. "The three common enemies of antique art, Turks, Englishmen (?) and gunpowder," have also pretty effectively labored here. The external surface of the marble is now everywhere corroded; in consequence of the occurrences mentioned, the steps no longer exhibit any sharp angles or plane surfaces; the stylobate has been much crushed by the falling stones of the cornice, especially at the angles, and other blocks were moved from their original beds by the force of the powder: the columns are in great part overthrown, the separate drums

of those still remaining upright being twisted from their original beds (Fig. 98), and the cell walls and columns along the sides are overthrown; the architraves are much injured in several places, especially near the angles, the cornices have gaps and are interrupted, and the pediments are but partially preserved. If some portions are still well preserved, with the exception of the everywhere injured external surfaces, the material has resisted the influences of the weather in great part, and the end and bed joints of some blocks are still very close [1], yet an excellent state of preservation of the monument, as frequently asserted, is entirely out of the question.

Note 1. This is in many places ascribed to incrustation in the joints.

An attempt at restoration made in 1841-1842 had as its object the reparation of numerous injuries, since with good intentions two entire columns were rebuilt on the north side and others half-way, only the drums of yet others being raised upright, and the northern cell wall was partially rebuilt.

The dissimilar foundations, the various irregularities in construction, the fact that the four angles are not in the s same horizontal plane, the shocks and distortions that the building suffered, the cracks in the architrave, the partial opening of the joints of the ashlars of the stylobate, the jagged projection of some in front of the face line, and the irregular form of the curve, do not permit the assumption of an originally intended construction of the now curved horizontal lines. The condition of the building as described no longer allows it to be determined with certainty, whether certain unusual and peculiar appearances were intended, or existed on it 2343 years ago. Also the difficulty of constructing such curves, and the consequences resulting therefrom for other portions of the architecture, with the actually invisible effect of this, since the ratio of its rise to its length is very small, and it chiefly lies below the horizon on the substructure, and on the architrave is intersected by the abacuses of the c capitals and became quite without effect, these would oppose an intentional arrangement, which would on the other hand be answered by a denial of the difficulties. If the construction

were so easy, why did not the masters of technical skill then succeed in executing it with regularity? Why could not the f first requisite for a detached and not very large building be once satisfied, and the four angles of the structure be placed at the sage height; but if the establishment of a curve was intended by the architect, it must then be said, that this experiment resulted quite too miserably and may be designated as anything but successful, especially if regarded as disproportionately enlarged, and not in accordance with its actual insignificance. For finally, what signifies 3.30 ins. or less than 1.18 ins. rise at the middle of lines respectively 229.66 and 101.72 ft. long, whose continuity is further interrupted at the centre by inserted steps for ascent? The jointing of the stones and the entire execution, with all the small defects described and which are inherent in the latter, is nevertheless so perfected, that it would be difficult to pass off as intentional such an imperfectly and awkwardly expressed arrangement as the present curves, if we were willing to accept them as original. For the honor of the Greeks, and on the basis of the evidence cited, we will allow the former to pass current in a higher degree for the beautiful Theseion in the face of the much discussed curves of the stylobate (Fig. 99), since we must likewise ascribe to changes in the ground the different heights of the stylobate of the Heraion at Olympia, where the execution is certainly less refined. Other Doric temples were indeed likewise free from this line of beauty, "only perceptible by the feelings."

A peculiarity in regard to the original curvature, that still remains to be described and affords opportunity for consideration, is the different dimensions of the lowermost drums of the columns; men are commonly inclined to deduce from the unequal measurements occurring on them conclusions in favor of originality.

Measuring on the surface in a plane passed through the centre perpendicular to the cell wall, there are found for the separate drums (which, as previously stated, were not of equal height, their heights frequently differing about 5.50 ins) greater heights on the external surface than on that toward t

the cell wall; these differences first result from the fact that the pavement of the portico is laid inclined, and they are increased by the inclination of the columns toward the cell wall. But measuring in a plane passed through the centre parallel to the cell wall, differences in measurement are again found on the surfaces of nearly all columns, so that on the pediment ends, for example, the lines on the southern sides have heights differing from those on the northern sides. It is evident that the differences are not great; they lie between the limits of 0.00 and 0.47 inch. Since the larger variations in measurements are mostly near the angles, an appearance might be produced, that it was intended to arrange by the irregularities in this direction an adjustment of the upper surfaces of the drums to the horizontal, and thus render possible a vertical position of the axes of the columns on them. The uppermost adjusting drum would then cause the flatter curve of the architrave.

If one here assumes it to have been the actual and sole intention of the architect of the Parthenon to build with reference to an adjustment of the drums to a horizontal, we must then again declare that he succeeded in this in only a very imperfect way. An earlier drawing even made the divergence of the axes apparent (Theoretically constructed, though never really apparent); the measurements of the drums taken in this direction exhibit the following differences (excluding the angle column). *Only perceptible by delicate measurements.*

East side	II	III	IV	V	VI	VII[1]	
East side	0.473	0.354	0.118	0.000	0.118	0.473	ins.
West side	0.394	0.197	0.079	0.197	0.275	0.275	ins.

Note 1. According to the Table, the dimensions of column VI are to be corrected in Fig. 97.

It would appear scarcely permissible to wish to establish a constant and uniform increase or diminution of the difference numbers to the right and left in favor of a system.

With a diameter of the lower drum of about 6.56 ft., and a with the previously described mode of bedding and setting it on the inclined surface of the pavement, a possible displacement of a few tenths of an inch (in places only 0.079 inch)

to one side or the other cannot be regarded as intended for a definite purpose. But it must not be forgotten here, that many drums were also displaced by the explosion.

Assuming an intentional curvature of the horizontal lines, the front surfaces of the triglyphs and metopes at the four angles must have angles other than right, yet this is not found to be true on numerous measured pieces. With suca a very flat curve and such a loose connection of the metope slabs, a decision in regard to these angles at the corners would originally have been made with difficulty, since the variations must have been quite minute. Now when the architrave on which rests the triglyph frieze is broken, and the building has suffered much by violent injuries and from decay, nothing certain can any longer be stated concerning this, and positive statements about the angles in question, such as are occasionally made, are to be very cautiously accepted under these conditions.

It must always remain meritorious that Penrose permanently determined the minute differences in measurement and the irregularities on the buildings; but I cannot defend the various optical and esthetical perspective studies and principles, which were deduced from these, and some of which are even ridiculous.[1] The occasional representation of the actual measurements by abstract numbers is only to be regarded as an eccentricity.

Note 1. Most of these are not based on a survey by the author concerned, but on unlimited faith in the three and four figure measurements of Penrose. I have elsewhere shown in regard to this, that his statements do not in all cases correspond to the actual conditions on the building, and that he represents things as better than they are in reality. I have to add, that many parts, whose dimensions he gives, in general no longer exist on the building and laso could not have been in existence 40 years since. Thus for example, on the west side, the dimensions of the front surfaces of the abacuses of the 1 st, 3 rd, 4 th, 5 th, 7 th and 8 th columns (taken from the north to south) are no longer to be determined, as well as those of the regulas and drops beneath the 5 th, 6 th, 7 th, 8 th, 9 th, 11 th, 13 th and 14 th triglyphs, since these were

shot away during the bombardment in 1826-1827: likewise those of the 5 th, 6th, 7th, 8th, 10th and 11th metope slabs, as well as those of the 7th, 8th, 9th, 10th and 11th triglyphs.

On the southwest angle column (thus the 9th column) of the western pediment, the edges of the flutes no longer fit on each other, hence the column or the different parts thereof are no longer on the old location, the five lowest drums still harmonize: the higher ones indeed harmonize with each other, but differ from the lower ones. This condition is shown in a greater degree by the columns of the eastern front; the northeast column and the next one have strongly displaced drums (see the corresponding Figs.), as well as the 5th and 8th (from north to south).

No longer to be determined, since they exist no more, are t the measurements of the fronts of the abacuses of the 3rd, 6th, 7th and 8th columns of this side, of the southeast angle of the architrave, of the 7th, 11th, 14th and 15th regulas and drops, or of the southeast angle triglyph.

Of the 13 columns of the southern side of the Theseion, but a single one has remained in position; in all others the drums are irregularly displaced (Fig. 100), and scarcely one of the many is in its original position; the same occurs in an equally striking way on the adjacent pediment end of this temple. What matters under these conditions the very slight differences on the side surfaces of the columns in the direction of the length (of the temple): a single slight twist to right or left about the axis of the drum would lessen or increase this for the drums with diverging beds.

But to wish to see a structural reason in these curvatures, a rule for protection against the effects of earthquakes and the insecurity of the site, must be abandoned; only when constructed in the reverse direction, as in Egyptian foundation masonry, did the curved horizontal lines possess a meaning, although a rise of 3.15 inches for a span of 105 ft. is of no practical value.

An esthetical demand for the curvature did not exist, but in regard to its beauty of effect, one could hold a different opinion.

Krell [2] holds this opinion in his Geschichte der Dorischen Styls; "Not paralyzed, as some would say, but strengthened by the curved horizontal lines, which were moreover formed in the eye, the beauty of such an effect is questionable and might a also be obtained by a nearer approach to the building."

Note 2. Geschichte der dorischen Styls etc. Stuttgart.1870.

If the Greeks also possessed "more uncorrupted" eyes than we do (from the less frequent use of straight-edges, bevels and plumbs !) and saw everything straight as if curved, so that perhaps only curves appeared straight, the curvature was then certainly necessary, when a horizontal straight line was intended.

But if it be proved to us, that all the grace and the eternal youth of Grecian architecture consisted in the distorted horizontal lines, which are moreover only to be recognized on a few monuments, we must then still gratefully reject this dogma.

The statement that the "scamilli impares" of Vitruvius were transferred to the lowest drums of the columns of Grecian Doric temples, according to the explanations, has but a limited value; as repeatedly proved in this case, the divergent beds of the drums are first arranged in accordance with the inclination of the columns inward and with the inclined floor of the portico.

Hoffer [1] believed that a fixed optical law must be accepted for the intended curvature, since he states that every long facade appears lower in accordance therewith, and the more so the longer it is, if one stands before its centre and looks toward both ends.

Note 1. Hoffer represents himself in his Beitrag zur Konstruktionslehre der Griechischen Tempel (Allg. Bauz. 1838, p. 371, 379, 387) as being the first, who has "given to his contemporaries a clear presentation of the system of construction of the Parthenon." His technical explanations and statements are also mostly acceptable and correct. But his wedge, flying buttress and curve theories afford reason for well grounded hesitation. The evidence, "that the system of curved lines on the Parthenon was actually based on the design and

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not on accidents" was not brought forward by him, while he neglects many things, like the architrave destroyed at the angles, the injuries in the substructure, the opening of the joints etc., and the results of the explosion, while he did not take into consideration a sinking of the building, which was or explained as such by him. He further states that the curve in the 3rd and 4th courses from the top of the substructure loses itself, and that only with the upper angle of the uppermost step does "the complete curve of the construction" appear, to which all homologous lines of the entablature are then parallel, which does not occur. For the courses turned inward, found by him, and their purpose, the drawing of the horizontals inward about 0.59 to 0.79 inch, that commences on the capitals and increases up to the last line of the cornice, while the tympanum is again curved back from a true plane, Hoffer can give us no explanation, but these are most quickly accounted for by the deformations that occurred there.

According to him, but a few triglyphs stand exactly plumb; the different pieces of the frieze were all fitted against each other at discretion, which was the less to be avoided, since almost every one had a different inclination to the vertical.

The deformation in the stylobate, which caused the cracks in the architrave and its changed position, must have likewise changed the position of the triglyphs and of the metopes, set with some play in the grooves.

Therefore these are the less suitable for proof, than the higher mutilated cornice. Just as little can the present condition of the pediment induce us to accept, that its upper limiting lines were originally at a slight angle, and were later raised to the correct inclination.

If this inclination toward both sides were exhibited on the building itself, the effect on the observer must then be increased, since the structure would appear longer to him than it is in reality. Whether the Greeks may have intended to increase the effect of their temples in this way must be left undecided.

Bötticher explains the curvature of the horizontals as hav-

having arisen from the compression of the foundations, built of meterials of inferior quality; Hoffer also calls attention to the fact, that on the eastern end (just where it rests on the natural rock and has the least depth of foundations) it has sunk toward the north, and then again raising this sinking, assumes in his communication a regular curve, which is to be regarded as an arc of a circle of 7087.84 ft. radius. He fixes the rise of this arc at 2.49 ins., and that on the Theseion at 0.985 inch.

But this raising of the angle and the regularity of the curve resulting therefrom are arbitrary and a concession to this theory, as he desires to assume and contrive something in its favor, and so provides himself with it, determined in a peculiar way. We are not authorized to make such corrections, concerning what we shall characterize as defects in workmanship, and which are produced by deformations or sinkings.

Hoffer also adds to this and specifies, as did Penrose later, that not all "similar parts of the temple were made entirely alike with painful accuracy, and he even ascertained variations by no means unimportant, which still made no disturbing impression on the general effect." Small defects and irregularities in the construction, with otherwise perfect jointing of the cut blocks, changes in the ground, deformations of violent character by explosion and bombardment, the decay of the upper surfaces, and the adhering together of the joints of the marble, are described by all investigators, and the condition of the monument resulting therefrom justifies the abandonment of the so subtle theory of curvature. At this time, when scarcely an angle of the building is uninjured, anyone would deceive himself, were he willing to fall into enthusiasm over the effect of curves, and to look for them as the elixir of life of Grecian architecture.

The slight negligencies in execution, where the beads are in many places omitted above the triglyphs or metopes, or it was forgotten to carve them in finishing, must be mentioned. But these oversights could be repaired by painting.

A curvature of the stylobate, especially on the sides, is a also noticeable on the unfinished Temple in Segesta, whose stylobate has never been dressed off, and rough pitched surfaces

of very different dimensions appear on all ashlars. It is as readily visible as on the Parthenon, and especially if the north side be viewed under accidental light, so that the vertical surfaces of the steps of the stylobate are in half shade and the horizontal ones are in full sunlight.

R. Koldewey and O. Puchstein remark on this matter, that all lines of the stylobate are "curved" convex, so that the southern stylobate has a rise of 3.15 ins. and the eastern one of 1.58 ins. for the corresponding lengths of 200.63 and 86.05 ft. These are curves that can scarcely be drawn at a small scale-- a chord of 200 ft. long with a rise of 0.26 ft.! If the construction be otherwise in good condition, which I am unable to affirm, and the jointing be accurate, it would hardly be possible to seek this curvature as from a later deformation. One need not believe in such, yet he should remember, that the stylobate is unfinished, that a good jointing may also be produced by the cementing together of the stones by rain, that many of the columns are hooped with iron, that architraves hang in iron stirrups, and also that yet other "curvatures" exist on the building. Are the four angles of the Temple also actually at equal heights?

Only if measured from the more deeply cut surfaces of the ashlars supporting the columns and forming the upper step of the stylobate, from the sinkings in which the columns stand, could be obtained any decision upon any courses. Then would it also not be forgotten, that only the stylobate ashlars loaded by the columns are still in place, the intermediate blocks have long since been removed by "stone robbers." The second column on the left of one pediment end is no longer the original one, the capital of the angle column is half broken off; the surface of the stone is eaten away, the drums of the columns are like cheeses and are weathered etc. -- Where is to be found the "faultless" condition of the building? [1]

Note 1. See the great photographs of the Temple, 19.69 ins. square, that are to be had in the trade, likewise the illustrations and text in the work: "Aus dem klassischen Süden." Lubeck. 1896. Text, p. 50, 51; plates, 113, 114; also Koldewey & Puchstein. p. 132-135.

An interesting communication is made in the work on Pergamon,[1] which we reproduce verbatim.

Note 1. Altertümer von Pergamon. Vol. 2. Das Heiligtum der Athena Polias Nikephorus. p. 23. By R. Bohn. Berlin. 1885.

"Finally, another peculiarity should be mentioned, the curvature of the horizontal lines in the foundation. The southern facade appears to be made entirely level, both the ashlars yet remaining as well as the preparation of the solid rock, small variations up to 0.59 inch not being considered, and the courses of the northern facade are too much broken to permit accurate observations. But the western facade is otherwise; the increase in height here continues from both angles to the middle and is indeed uniform in all courses. The maximum of this rise amounts to 2.16 ins. at the centre. That such a regular curve could not have been produced by an accidental sinking is clear. But since the opposite side is too much disconnected to show anything similar there, I can in nowise deduce from this single observation an intended curvature of the horizontals."

On this building, the substructure of the southern side is entirely horizontal, those of the northern and eastern sides can no longer be determined, and that of the western side is curved; horizontal construction and curvature therefore appear in the same structure.

We prefer to adopt Bohn's views, that it cannot here be a question of an intended curvature of horizontals, and just as little and for similar reasons, as on the Parthenon and Theseion. Defects in workmanship are here to be considered as proved by the existence of straight and curved substructures on the same work, and I cannot forbear to refer it to the well known occurrence in practice, that in setting ashlars from the two ends toward the middle, the workmen come out rather too high at the centre. In setting long courses of ashlars, workmen are rather inclined to have the setting strips rise, than to slope downward. These small additions for different ashlars are finally added together and produce at the junction at the middle the excess over a true horizontal. Small variations of 1.97 ins. rise for a horizontal distance of 42.65 to 98.42 ft.

may well be passed by the superintendent of the work, as assuredly done in Pergamon.

On the old Temple in Corinth, a curvature was likewise discovered on its western side,[3] which for a length of 65.70 ft. h has a rise of 0.79 in. at the centre. A similar one is not s stated for the longer side. With this it should be noted, that an earthquake at an early time threw down the temple and prostrated most of the massive columns. At the very least, 2400 years have elapsed since its erection, and "the earthquakes of the last 50 years have indeed not injured the temple, but the stylobate under most of the columns still standing was found to be so ruined, that a not distant time the complete overthrow of the temple (here should rather be said; of the 7 shafts of columns yet standing with their half fallen and ruined architrave blocks) may be predicted with certainty."

Note 3. Mitt. d. Kais. Deutsch Arch. Inst. p. 297-308. Athens. 1886-1887.

Under these conditions the assumption is scarcely probable, that a deformation has not occurred here, and that in spite of these primitive conditions, an unusual accident may not have dislocated the stones and the solid rock by a small amount or have changed their position. But we will for the moment drop the possibility of defects in workmanship and ask whether the discoverer of the curvature really believes the foundation of a building to be actually unchangeable, if it stands on the solid rock? Why may not a sinking occur, when the lowest step of the temple is cut out of the solid rock? Mediaeval and even other architects frequently held the solid rock to be truly unreliable, and exactly to the fact that the Friedrichsbau in Heidelberg is founded on the solid rock is it to be ascribed, that the two principal facades have been considerably separated from each other by the widening of the cracks in the solid rock in consequence of the admission of water.(Thus not at all by suddenly occurring natural accidents).

Also for the Temple of Poseidon in Paestum, R. Koldewey and O. Puchstein [1] remark, that as in Egesta, the surfaces of the stylobate and of the step are not horizontal in direction.

Note 1. See Die Griechischen Tempel in Unteritalien und Si-

Sicilien by R. Koldewey and O. Puchstein. Vol. 1. Berlin. 1899, both for Egesta and Paestum. In the work mentioned the material is carefully sifted and treated; it may be counted among the best on the domain of antique architecture, both in a scientific as well as in a purely technical respect. All questions are certainly handled clearly and wisely with an attempt to solve them.

The building has suffered greatly, it is torn apart at top at both ends, and the eastern facade lies a few inches lower than the western, yet on the facades may be recognized an evident, though not uniform sinking toward the angles, even by observation with the eyes alone. The rise at the centre is given at 0.79 inch on the ends and 1.58 ins. on the sides for the lengths of the structure at 79.20 and 196.46 ft. The rises are therefore less than in Egesta, it being here also assumed, that the four angles of the stylobate are at the same height.

Here it is at least admitted by the observers, that the four courses of the stylobate do not lie in the same horizontal plane. This structure would be badly constructed in technical respects, if changes in the foundations were not assumed, as made probable at the Temple in Priene, where the like conditions occur as at the Parthenon.

Jacob Burckhardt [1] considers the matter from en esthetic point of view and exaggerates, when he says that there is not a single mathematically straight line on the entire building. Expressions of the same feeling required the entasis of the columns and sought everywhere in visible mathematical forms to make apparent the pulse-beat of the inner life. That one now sees curves everywhere without first proving them by measuring instruments, and that they do not exist in feeling alone, this remains a weak side of the proof of their original existence, and if this be assumed, then would their realization in practice not be free from the objection of technical impossibility. But from this the constructors are protected by the quality of other works, especially on the Parthenon and Theseion. That the Erectheion on the Acropolis of Athens and other works of the Ionic style, which do not have the curvature of the horizontals, manifest an equally full pulse-beat of the inner life,

must indeed be without doubt.

Note 1. Der Cicerone. p. 5. Basle. 1860.

So much is now assured, and this will also be felt and must be conceded by the friends of intentional curvature, that in the present condition of the temples considered, and after all accidents,that have happened to them, especially at the Parthenon, where the stylobate ashlars were in part moved from their beds, and the drums of the columns were forced outwards, the curves now existing are not at all the original ones. By this fact is the basis withdrawn from many theories, and for anything further, we may satisfy ourselves by a reference to the worthlessness of horizontal curves to every practical architect in Maertens.

Note 1. Der optische Massstab etc. 3 rd edition. Berlin. 1 1884. In reference to structures, also see Durm, J. Die Propylaen von Athen. Zeit. f. Bild. Kunst. p. 294-296. 1884.

In reports on the excavations in Sunion [2] Dörpfeld calls attention to the fact, that under two columns of the portico on the stylobate on the northern side, wedge-shaped drums of columns of very slight height (0.20 to 0.00 ins.) were found placed, and which moreover were not employed to give the axes of the columns an inclination inward, but to make the surface of contact of the column and stylobate horizontal. Further, this arrangement did not exist on the nine columns of the southern portico. But this leveling did not occur here in a plane parallel to the wall of the cell, in the manner elsewhere referred to Vitruvius, but in one perpendicular to this wall, which was necessary, since the pavement had a fall from the base of the wall to the face of the uppermost step of the stylobate.

Note 2. Mitt. d. Kais. D. Arch. Inst. Athens. 1884.p.324-337.

The inclination of the pavement of the portico has also been proved elsewhere, and therefore this statement is not to be doubted. Dörpfeld sees in this arrangement the "scamilli impares" of Vitruvius, which interpretation will be readily accepted by every technician, although Vitruvius places it quite d distinctly and clearly in the plane parallel to the line of the columns.

There were practically two methods of equalizing; either the

bearing surfaces were wrought on the stylobate ashlars, or the "scamilli impares" were formed on the lower drums of the columns by making their beds divergent. With these "scamilli" the slope of the pavement of the portico and the oblique position of the columns could both be taken into account.

Koldewey [3] prefers to have discovered the "scamilli impares" for a temple in the Ionic style in Messa on two slabs supporting columns. He assumes, since this may have been the case in Priene, that also in Messa the pavement of the portico had no slope, in contrast with Attic buildings.(See on the contrary the final conclusion, where it is definitely stated, that the floor of the portico in Priene is inclined). Since the elevation of the bearing surface above the upper surface of the stylobate is now unequal on all its sides, he infers from this that the front edge of the stylobate must have been "curved," and since these bearing surfaces in a plane through the centres of the columns parallel to the wall of the cell had the maxicum and minimum elevations, they thus corresponded "exactly"to the previously unknown "scamilli impares" of Vitruvius." The two slabs supporting a column comprise an inner and an outer ashlar.

Note 3. Die Antike Baureste der Insel Lesbos. Berlin. 1890.

The Temple in question is built of trachyte-tufa and must have been a pseudoperipteral structure with 8 × 14 columns; but according to the report of the discovery [1] only the two stone slabs mentioned have been preserved. On these slabs are circular marks of location, not completely preserved for their entire perimeter, which rise to different heights above the injured ground of the slabs, almost flush with the ground, [2] or rise above it 0.04, 0.08, 0.12, 0.16 or in one place 0.59 in. But one finds such appearances everywhere on antique ruins, which have their natural explanation in the fact, that the places covered by the shafts of the columns were protected, while the adjacent surfaces were injured by visitors, by cleaning, and still more by the effects of the weather. To the c circumstance that protected and exposed surfaces occur on the same stone and leave the corresponding marks, we owe the possibility of a reconstruction of so many antique monuments; it

has occurred to no one until now, to accept these more or less visible or conceivable marks of location for the "scamilli impares" of Vitruvius.

Note 1. See page 49 of same work.

Note 3. See the corresponding illustration in the work mentioned.

The material in the present case moreover is so uncommonly small in proportion to the whole, that it may at least appear very venturesome to base such distinctly expressed conclusions on this discovery.

In the work on Priene of the Royal Museum at Berlin in 1904 (p. 88 et seq.), there is stated in the text on the substructure of the Temple of Athena:--

"Not to the insecure foundation but to the numerous cracks and holes permeating the rock beneath is it to be attributed, that the northwest corner of the stylobate has sunk considerably." It is further added, that the surface of the stylobate, like the floor of the portico, is not exactly horizontal, as stated by Thomas, but it is slightly inclined to the exterior on all four sides of the temple, manifestly for the purpose of removing the water. The difference of heights of the front and rear edges of the stylobate amounts to from 0.59 to 0.79 inch, or in one place to even 1.26 ins. Two methods were employed for equalizing the difference in heights; the plinths were sunk in the stylobate slabs , or the beds of the plinths of the columns were dressed off obliquely. It results from this, that the columns were set vertical and were not inclined toward the wall of the cell, as Vitruvius desired.

The note on page 89 states that the disk-shaped "scamilles" observed by Koldewey on the Temple of Messa (Baureste der Insel Lesbos, p. 54) evidently served for the same purpose.

Above the foundation masonry rises the temple or the other public buildings with the finest jointing and coursing of the ashlars; the stylobate (plinth) as a structure divided into several steps, that separates the house of the deity from the earth, rising above this as a monumental sacred offering presented to the god. It serves as a pedestal for the columns and the cell walls. A technical procedure, that prepares for the

superstructure and leads to it. According to the order to which they belong, the steps sometimes exhibit the simple rectangular form of cross section, sometimes a richer recession at the front surface. The upper surfaces are slightly inclined toward the front edge for carrying off the rain. The number of steps varies and keeps within the limits of 1, 2, 3 to 6 (Theseion in Athens, Heraion in Olympia and Temple of Zeus in Akragas etc. etc.), thus it is not always the same, owing to whether attention was to be paid to the adjacent ground or not. They were frequently not regarded as steps for ascending, on account of their great height, from 14.17 to 23.62 ins. T The ascent occurred either by ramps or by special steps placed before them, or by steps cut in the stylobate or intermediate steps thereon.(Fig. 102).

The uppermost step served as a base for the column, whereby this came to stand on one block (Theseion, Propyleion in Athens) or on two, which were then jointed under the centre of the column.(Parthenon). Between the antes of the opisthodome of the Theseion were employed long stone slabs, abutting under the c centres of the columns.

A direct connection of the stylobate ashlars by wooden or metal cramps is usually excluded, though not without exceptions. (Pergamon).

If Le Bas be correct in his publication [1] on the Temple of Artemis Laphria at Messene, then were the ashlars of the stylobate joined in length and breadth by double dovetails and Z-cramps, but not in their height.

Note 1. Le Bas. Voyage archaeologique en Grece et en Asie mineure. Paris. 1848. Palte 2.(Without text).; Also Baedeker's Griechenland (1888 and 1904),where the building is but briefly mentioned; I myself cannot decide.

O.Puchstein [2] desires to recognize from two uncovered traces at the Temple in Egesta, "that the outer blocks of the angle intercolumniation of one end were secured by anchored dowells." Against what? Against slipping on account of the curvature or wherefore? As drawn, the cramps took hold between the ends of two ashlars, like the dowells above and below in the solid substance of the ashlars. Casting in with lead the dowells and

cramps thus arranged would only be possible, if the joint surfaces had no anathyrsis; wherefore I could not satisfy myself by repeated visits, why the drawings of R. Koldewey and O. Puchstein, as well as those of J. J. Hittorf, do not give an explanation of this. If then the dowells were exactly an the centre of the lower stone, then it might enter the two placed above, or if it was outside this, it then entered only one stone; but in both cases it obstructed the setting of the ashlars from t the front and from the side, and as elsewhere with dowells, t these could only be lowered to their places from above.

Note 2. Page 34. Plate 118.

As it may follow from this, that "since the casting channel (in the centre of the stone is therefore no channel!) is always toward the corner, then must it be assumed, that the blocks were successively set from the middle of the side toward the angles" -- is hard to understand and contradicts by this assumption all similar methods discovered.

On the stylobate of the Altar at Pergamon (III, I, p. 15-17), the rise of the steps is from 8.41 to 9.06 ins.; the treads a are from 15.36 to 16.14 ins., their entire width being from 18.50 to 24.80 ins. Here is proved by the facts the direct connection of all steps by cramps at the sides, for others only at the back, and again for yet others by dowells in the height.

At the great pyramidal stylobate of the Mausoleum at Halicarnassus, the steps were made immovable directly and indirectly, by interlocking the stones to be connected and by iron cramps with ends bent downward.(See Fig. 104, after the original in the British Museum. Also see C. T. Newton's History of Discoveries at Halicarnassus etc. London. 1862. -- Where cramp holes are given, but no cramps).

The steps at the Parthenon and Theseion only overlap each other a few inches, 1.18, 4.33 and 5.91 ins., while again on other structures, they overlap nearly as much as they project. The uppermost layer is divided into those loaded by columns and those free from all pressure and merely inserted. The latter were then only set after the building was completed and the scaffolding removed (see Temple at Egesta), in order to protect

the edges from injury. Inserted steps (step blocks) would in time become in height different from the adjacent loaded blocks. To this mode of setting the stones and to the slight bonding of the courses together is indeed due the deformation of the substructures of many Grecian temples. Likewise at extraordinary occurrences, for example at the powder explosion in the Parthenon, the loaded blocks largely remained in correct position, while the inserted blocks were all forced outward from their original positions, frequently 0.47 inch or more out of line.

At the end surfaces, the stones only touch each other on the margins over a marginal joint 2.36 to 3.15 ins. wide, while the central portion is recessed (Fig. 105; Theseion, Parthenon, Temple of Poseidon in Paestum); only thus was it possible to produce the magnificent joints exhibited by the ashlar masonry of Grecian monuments. They are not otherwise connected together by special arrangements. The Propyleion in Athens, the Temple in Egesta and the Temple of Poseidon in Paestum, neither of which was entirely completed, show the surfaces of the inserted and the bonded steps but partially wrought, drafts 1.97 and 2.76 ins. wide outline the completed form, while the upper portion projects 0.12 to 0.16 inch beyond them and is only pointed. On these partially worked surfaces, the columns of the Propyleion at Athens are set by sinking a circle or a square area to the true level, and this is very carefully rubbed down; in order that the rain water may not stand therein, small channels are incised and extend to the outer edge. The final dressing of the remaining portion of the stylobate was left until a later time.

The never completed Temple in Egesta exhibits similar contrivances for protecting the angles and surfaces from falling scaffold timbers, tools, or dropping stone spalls, which must have been produced in finishing the columns and the surfaces of the walls. To make the setting of the drums of the columns possible, the supporting blocks beneath the columns here received on the roughed upper surface a circular sinking, carefully worked true, which had a diameter about 3.54 ins. greater than that of the column, and a depth of about 1.18 ins. The drums

were set in these sinkings, after a margin 2.55 ins. wide had been cut on them with the required diameter of the column.0.97 inch was afterwards dressed off the external surface of the d drums (Fig. 106) and 0.97 to 1.18 or 1.57 ins. from the surface of the stylobate.

Adjoining the uppermost step of the substructure were the f floor slabs of the portico of peripteral structures, and for those without columns, it extended to the interior, thus properly terminating at its top the substructure. Constructed of square or rectangular slabs of limestone 7.87 to 9.45 ins. thick, this was dressed with a slight inclination for the removal of rain and waste water, like the upper step of the stylobate; these were either bedded on separate masonry piers or intersecting walls, or directly on the coursed foundation and forming its covering layer. The inclination in the portico of the Parthenon amounted to 0.46 inch foh a width of 15.29 feet.

The floor of the Temple of Poseidon at Paestum is executed in a peculiar way; raised courses of ashlars 5.25 ft. wide serve as supports for the inner columns; adjoining these are slabs of limestone 1.54 ft. thick and 7.68 ft. wide, their upper surfaces sunken next the wall and forming the floors of the side aisles; 3 rows of slabs are laid in the centre aisle, the middle one being horizontal and sunk to the level of the floors of the side aisles, and the adjacent ones being laid inclined to it.(Fig. 107). From which it may be assumed, that the present form of the floor of the middle aisle has likewise been produced by sinking it.

The Temple of Zeus at Olympia forms an exception in the floor of its pronaos, the simple pavement of slabs is abandoned and gives way to the magnificent mosaic, made of pebbles from the Alpheios (tritons surrounded by palm ornaments, the individual panels being bordered and separated by fret patterns), discovered and published by Abel Blouet. According to Pausanias, the portion of the floor immediately before the statue of the deity was not laid with marble, but with black ashlars; a raised border of Parian marble surrounded the black panel in a circle, so as to prevent the oil from flowing away.

Olive oil was here poured upon the ivory, so that it might

not be injured by the marshy location of the Altis; water was used instead of oil for the chryselephantine statue in the Parthenon; the statue in the Temple of Epidauros stood over a fountain, so as to make this saturation unnecessary. the last statement of Pausanias was not corroborated by the excavations.

The floor of the portico was composed of small river pebbles set on edge in mortar, then covered by a coating of smooth stucco mortar, while the side aisles in the interior had a coating 1.57 ins. thick on a basis of stone slabs. The remains of a marble facing in different colors at the entrance side belongs to the Roman period. (Also see the German work on Olympia).

Plastered and colored pavements are also found in smaller t temples in other places, as for example, floors of red stucco on a bed of limestone slabs at Egina; the plastered Sicilian temples must have had similar floors of colored stucco.

Walls enclose the sacred apartment, where statues of the deity and gifts were placed, secluding these from profane eyes and affording to art works protection from weather and from t theft. A consecrated interior was surrounded by them, richly ornamented architurally and decoratively, and it was enclosed above by a protecting ceiling. In accordance with its developed purpose, this was externally treated plainly and without ornament, either constructed of limestone ashlars with a coating of stucco, or of marble ashlars with the most careful jointing, the joints being almost invisible, and internally decorated by paintings. [1]

Note 1. As stated in the Introduction, unburnt bricks were also employed instead of monumental ashlar masonry in the oldest temples, as well as later on account of lack of means, probably in the manner described for the walls in Troy. The Heraion in Olympia should be included here.

Being vertical and "subject to the general law of proportional development", the walls consist of a broad base projecting beyond the foundation, of the wall proper, and of a crowning cornice or slightly projecting terminal member, on which rest the ceiling beams. The proportion of thickness to height in most cases varies from 1 to 9 to 1 to 10, or 1 to 10.5, while the height goes from 2 to 2.5 times into the free length, or

the longest free portion between transverse walls; hence there results from this always a great, or at least an average stability of the walls. [2]

Note 2. See Rondelet. Traite theoretique et pratique de l' art de batir. Paris. 1856. p. 2-17.

If in the masonry of retaining walls, the strength and character of the masonry are made prominent by the coursing, batter, buttresses, and the rough visible surfaces of the individual ashlars, these ideas decidedly recede into the background in the aspiring walls of the cell, free on both sides. The walls are battering inside as well as outside, though not in all cases in a perceptible manner; Egyptian tradition required a considerable batter on the exterior of the walls of the structure, but it scarcely occurs here. The same feeling that desired the columns to be diminished upwards, must have likewise prescribed a corresponding diminution in the thickness of the walls. The most apparent reason for the construction of walls increasing in thickness downwards was indeed in Egypt, as everywhere, the greater durability, solidity and stability of masonry arranged in that manner. The particular motive of the primitive dykes of the Nile was not required for this, as frequently assumed; men usually soon observed that a body stands the more firmly, the broader its base. The probability of its better preservation was indeed the cause of the careful dressing of the external surface, exposed to the wind and weather.

The base of the wall mostly consists of one or two low plinths projectinn beyond each other,(0.98 to 1.48 ft. high), or sometimes more, sometimes fewer (Parthenon 2, Egina 2, Phigaleia 1), the lower one of these usually having the least height (as likewise frequently occurs on the stylobate), or of a richly moulded base with plinth, cyma and band, as on the Theseion, these members then being returned around the ends of the wall (antes), for which they become formal pier bases (Fig. 109).

Above the base or plinth course as a characteristic rises a double band course (orthostate), according to the magnitude of the building, 2.62 to 4.88 ft. high, that projects 0.31 to 0.39 inch from the true plane of the enclosing wall, These slabs are of equal or unequal heights (See Paestum, the Heraion and the Temple of Zeus in Olympia, the Tholos in Delphi, the Ionic

temple on the theatre terrace at Pergamon, and the corresponding Figs. 109, 110, 111, 113 and 115) and touch only on the joint surfaces in narrow borders (anathyrose). Their heights are in proportion to their lengths as 1 : 2 up to 1 : 2.6 . (Parthenon, Theseion).

On the colossal Temple of Zeus at Akragas, that also presents other riddles, the upper masonry rests on a high plinth with intermediate ogee course, that are together treated as a base for the half columns of the pseudoperipteral structure. Above this commences in courses of equal heights -- without orthostate -- the ashlar masonry of the walls, the isodomum of Vitruvius, executed in bonding and with the finest jointing.(Fig. 112).

The courses are of uniform height up to the corniceand exhibit on the external surface a ratio of 1 and of 2.4 of height to length. Headers and stretchers, the latter not touching each other in the middle of the wall, alternate in the courses; mortar is not used, but a sufficient connection is obtained by means of pieces of iron set in lead. Small iron dowells c connect the stones vertically and thus prevent the removal of one stone from above another, and iron I-shaped cramps connect them lengthwise (Figs. 11, 116, 117); thus preventing the slipping of the stones; Their contact on the end and bed surfaces is only on borders 2.36 to 3.14 ins. wide (anathyrosis). Not only marble ashlars, but even the common limestone ashlars (see Egina) were dressed and connected together in the same careful manner. Behind the dowells are usually found small holes, the so-called "bar holes,"cut in the upper bed, in which the crowbar was inserted to slide the ashlars together.(See Parthenon, Heraion at Olympia, and the Mitt. d. Kais. D. Arch. Inst. Athens. Abt. 1881. Pl. 12). Bronze was never used as a common material for cramps here; belief in its presence has unfortunately aroused the avarice of men in but too many cases, and has contributed to the destruction of many monuments. Even on Attic soil may be seen the criminal traces, the cutting away of columns and ashlars at bed and end joints, scarcely any monument whatever being free from these trial holes!

On the Heraion, and also in part on the Temple of Zeus in Olympia, the base slabs (orthostate) of the wall are arranged

on the exterior alone, while the courses in the interior are constructed with low ashlars. The ashlars then have, for example on the Heraion, a thickness of 1.22 ft. and a length of 7.38 ft. with a height of 3.41 ft., which corresponds to four courses of ashlars 2.63 ft. thick. On the opisthodome (northwest angle of the Temple of Zeus, the side walls are composed of two courses of slabs connected by iron I-cramps set in cast lead and together 4.59 ft. thick with a height of 5.73 ft(Fig. 111). The slabs in the cell wall are E.38 ft. long, 2.20 ft. thick and 5.73 ft. high, corresponding to courses of ashlars 2.46 ft. thick and 1.87 ft. high. While in the Temple of Zeus, the ashlars are indirectly connected by iron cramps, which also occurs on the Metroon, and indeed already in the masonry of the substructure, the dressed ashlars of the Heraion are joined together without any connecting material, and the blocks do not touch on borders but in sharp angles, produced by undercutting the end joints of the ashlars. This kind of jointing and dressing is the older.

Also without the use of iron cramps, a temple wall 2.10 ft. thick was further constructed during the Hellenistic period in Sillyon[1], being indeed built of limestone ashlars with smoothly dressed surfaces, where a course of headers alternates with two courses of stretchers in height.

Note 1. See Niemann & Petersen. Städte Pamphyliens und Pisidiens. Vienna. 1890. Vol. 1. p. 77.

On the Ionic Temple on the theatre terrace at Pergamon, the cell walls are built hollow (Fig. 114), bu courses of headers and lavish use of dowells and cramps, made just as stable as a solid construction.

At the Ptolemaion on Samothrace, courses of headers and stretchers alternate in height and show a connection by iron cramps, similar to that of the Attic monuments, excepting that U-cramps are employed instead of I-cramps.[2]

Note 2. See Conze, Hauser & Benndorf. Neue archaeologische Untersuchungen auf Samothrace. Vol. 2. P. 39. Vienna. 1880.

The exclusive use of iron for bonding walls at the Theseion, the little Temple of Nike, the Olympeion and the Parthenon in Athens, at the Temple of Zeus and the Metroon in Olympia, the

Temples on Egina, in Sardis and Ephesus, the Temple of Poseidon in Paestum, the Temples in Selinus, the Propyleions in Athens and Eleusis, Hadrian's Gate and the Market Gate in Athens, etc. has already been pointed out. The use of wooden double dovetails was likewise mentioned.

Besides the U-shaped cramps, bent at a right angle at both ends, these projections then being set vertical or horizontal, and I-shaped cramps, as well as square pins and dowells, N-shaped and Z-shaped cramps are found, though rarely. Hauser found on Samothrace, besides iron cramps, bronze joggles in last lead and also lead cases from 2.75 to 3.15 ins. high, 1.57 ins. wide and 0.59 inch thick.[1] Small bronze cramps of N-shape also occurred in Sicily; in Epidauros were found bronze dowells of the dimensions and form illustrated in Fig. 118; the metallic double double dovetails with pins and set in lead on Lesbos and Samothrace are worthy of mention.

Note 1. Same work. p. 70, 71.

In the Acropolis Museum of Athens are also preserved in architectural fragments of poros stone lead dovetails and iron dowells set in lead cases as well as I-champs.(Fig. 118).

Lead was by preference employed for patching and for fixing small ornaments of stone (for example, drops on mutules), as repeatedly shown by examples in Athens, Olympia, and other places.(Fig. 118).

The iron I-cramps in Olympia have a length of 9.49 to 23.6 ins., according to the dimensions of the blocks of stone to be cramped together, with a cross section up to 0.98 inch high and 0.59 inch thick. Small round bronze pins for fixing added pieces may also be seen in some marble cornices in the Acropolis Musemm at Athens.

Bronze reappears more prominently as the connecting material for monumental structures in the later time, in the form of d dowells and cramps, the latter in dimensions up to 2.10 ft. (See Fig. 119, pieces from Temple at Baalbec, now in Pergamon Museum at Berlin).

Of special value for determining the procedure in setting stone and its sequence are such in which the lead casts by casting channels are still preserved. Bronze dowells, one half

prismatic and half cylindrical, enclosed in bronze cases still exist in the original pieces, as well as bronze dovetail cramps with little clips. At the so-called Basilica in Paestum are shown together dovetail (double axe-shaped cramps), U-shaped and ornamented cramps at the angles of the stylobate (Fig. 103). In Delphi were employed 40 to 51 large iron H-cramps set in cast lead, in Miletus were found prismatic wooden dowells in cast lead, original specimens of which are preserved in the Louvre Museum in Paris (see Fig. 119), in which the distinction is made by the inscription:--"Bronze fastenings of columns and wooden fastenings of the walls of the cell.

The form of cramp can scarcely be utilized for determining the age of the buildings. Wooden dovetails with carved royal cartouches were found in Abydos and elsewhere. The Egyptian precursor was followed by the Grecian, and in it doubtless appears the most ancient form of cramp; it would be a criterion of the high antiquity of buildings, if it did not recur in those certainly dated later. Anchored iron dowells, cramps and pins were found together in Egesta.(Fig. 103).

The cornice member, that crowns and finishes the cell wall at top, usually consists of a rather low band projecting but slightly from the face of the wall, and which is decorated by a fret pattern and terminated above by an ogee cyma. When the originally solid end wall was changed into antes or a complete colonnade, another mode of treating this portion was introduced, the form of the cornice of the portico or an allied form being transferred to it, the simpler cornice being used for the former partition wall, which was then the wall containing the doorway. The architrave fillet could then be introduced for a richer effect, cutting off a plain frieze with the band, as in the opisthodome of the Parthenon.

The dressing of the external surfaces of the ashlars was only done after they were set in the building itself. The internal and external walls of the portico for the guard, as well as a part of the gateway walls of the Propyleion in Athens, are still unfinished; drafts 7.87 ins. wide are carried around them above, below, and on their sides, and indicate the plane down to which the surfaces were to be worked; the ash-

ashlars of the external wall still frequently retain the bosses for setting, or rather guide-marks for the work, frustums of square pyramids, whose sides are from 5.90 to 7.87 inches square at the base, and their projection is 3.94 ins. or more. The most interesting example in this respect continues to be the never completed Temple in Egesta.(Segeste).

The columns do not stand vertical in Attic monuments and on the so-called Temple of Poseidon in Paestum, but are somewhat inclined toward the wall of the cell, and the angle column in the direction of the line bisecting the angle of the stylobate. The inclination is very slight, but is plainly visible to an eye skilled by practice. The inclined wall has the inclined column as a result.

It may have been optical but not structural reasons, that required the slightly oblique position; the diminution of the column, the receding of the length and breadth of the entablature as opposed to the stylobate already gives to the structure in a very realistically expressed way the character of pyramidal aspiration, so that it did not need the extremely slight addition of the inclination of the columns; with the thick and massive form of the free supports, this has no importance for any structural purpose. An ancient Egyptian architectural law was evidently followed in this, which certainly no longer had much meaning in this weakened form; but it was also perhaps desired to lessen in the portico the divergence of the two enclosing surfaces, of the wall of the cell and of the column. (Compare Parthenon, Theseion and Propyleion in Athens, Temple of Poseidon in Paestum).

The inclined position of the columns was effected in execution by the insertion of drums with diverging beds between those with parallel beds.(Fig. 121). On the Temple in Egesta, the drums are of different heights, varying in dimensions between 3.05 and 4.13 ft. and with entirely parallel beds, so that an inclination of the columns toward the cell wall is not proved on this Temple. The same was likewise observed at the temples in Akragas, so that the rules applied on the Doric monuments of Attica and on the Temple of Poseidon, but were rejected in Sicily and at other places. They are not generally ap-

apparent on Ionic and Corinthian buildings.

The first of these was set on the step of the stylobate and the last was beneath the capital. The axis of the column then rose perpendicular to the upper bed of the lowest drum, the successive drums with parallel beds being arranged parallel to this. The lowest and the highest drums of the buildings mentioned measured on their external surfaces in an intersecting plane perpendicular to the cell wall, consequently do not exhibit equal heights; the upper drums further show the greater height on the side opposite that of the lower, since a horizontal resting place must be arranged for the architrave.(See the construction of the columns of the Parthenon, Fig. 122).

At the ends of the Parthenon (the sides are destroyed at the centre), the uppermost and lowest drums exhibit another peculiarity, since they have also different dimensions on their surfaces in a plane passet through their axes parallel to the tympanum. The larger measurements of the lower drums are in most cases on the surfaces toward the sides of the building (to the right and left of the centre of the building); the reverse occurs on the uppermost drums, where the greatest measurements are found on that side toward the middle of the building.

The differences between the two surface lines of the lower drums are not uniform, but diminish from the angle column toward the middle of the building for drums varying in height an inch or so, though not constantly or uniformly to right and left, so that omitting the angle column, the following differences in measurements result for drums averaging 2.89 to 3.11 ft. in height.

.472 .354 .118 .000 .118 .472 inches on east end.
.394 .197 .079 .197 .275 .275 inches on west end.

With some forcing and in accordance with an imperfect passage of Vitruvius, one might conclude that a further arrangement of the axes of the columns was intended, were it not that the equal and unequal measurements on the lowest drums in a direction at right angles to the wall of the cell permit the possibility of indeed very slight inaccuracies in the preparation of the surfaces on which they rest, which might easily occur with the mode of construction described, and that the deformations of the stylobate make any positive conculsion impossible.

Differences in inches.

1.575 1.024 1.024 1.024 0.945 0.945 0.945 ~~1.457~~ inches end.

1.220 1.221 0.787 1.496 0.984 0.866 0.866 1.535 inches.

Height of drums.

2.82 to 3.22 ft. on east end.

2.92 to 3.48 on west end.

Considering the deformation of the stylobate and the differences in measurements of the lower drums, if the positions of the axes be laid off, which may best be made clear and visible by a disproportionate increase of the measurements of the heights, the irregularities appear disturbing, though scarcely visible in reality, according to the graphical representation in Fig. 123, but it will hardly occur to a practical man to deduce from these imperfections special rules for the construction of buildings. The Parthenon and Propyleion have withal suffered so much from destruction in all ways, that we cannot declare everything now lound to have been originally intended to its entire extent.

Just as the walls consist of the plinth, the masonry above it and the crowning cornice as a termination, so the columns, excepting those of the Doric order, are subject to a division into three parts, consisting of the base, shaft and capital.

Not merely in form but also technically are these separated from each other, and they are again artistically combined into a whole.

On the uppermost smoothed step of the substructure (stylobate) rises the detached support, either absolutely vertical or slightly inclined toward the wall, in the form of a frustum of a cone with straight or curved external surface, sometimes in heavy and stumpy, sometimes in elegant and slender proportions.

The base is wrought from a single block and rests loose on a block of the stylobate or extends over two blocks, not being sunk into or fastened to them by dowells. Only in rare cases is this purely technical expedient employed, as for example on the Temple of Hercules in Akragas, the Sanctuary of Athena in Pergamon etc. The columns of the Temple in Akragas mentioned were thrown out along the longer side by an earthquake, so that both on the stylobate and the bottom surfaces of the lower drums of the columns are visible the dowell holes.(Also see the

Temple of Apollo at Delphi, Fig. 124, and for Pergamon, Plate 22 of the second volume of the splendid work on Pergamon.)

The shaft is either monolithic , or in by far the most cases is built of blocks of unequal sizes (drums), that according to their ratio of diameter to height are connected by wooden or iron dowells. The greatest value was placed on a fine joint between the surfaces in contact, whether the joints remained visible or again disappeared beneath a covering layer of stucco.

The Doric column "as an earth borne force", mostly constructed of massive blocks, by its size and weight required in most cases a special connection of the blocks together. What seemed necessary for walls built of small ashlars coulh here be omitted, while for slender Ionic and Corinthian columns, the drums must be joined by iron dowells into a rigid support. (See Fig. 126).

To make possible a good jointing, that was absolutely demanded and especially for the white marble columns not covered by stucco, the beds of the drums were sunk toward the centre, only the external annular surface being carefully smoothed and rubbed, on which they rested and transmitted the loading.

The drums were fixed at the centre by two square wooden blocks (Fig. 122; examples of such in the Museums at Munich, Athens etc.); in one was fixed a cylindrical pin, a circular hole being bored in the other to receive one half of the pin, whereby a rotation of the upper drum on the lower one about their middle axes was made possible, without its being moved out of centre. For this was necessary the solid fasteningof both prisms in the stones, accurate dressing of the contact surfaces, likewise with the aid of fine sand in case of defects in workmanship.

Corrections in the jointing could thus be made without being obliged to hoist the stone afterwards.

The square wooden prisms and the cylindrical pin were not intended as an arrangement for fastening, but they merely rendered good service in setting. In proportion to the weight of the stone, about 6.619 tons for a drum at the Parthenon, then a cylindrical wooden pin measuring 1.58 inches in diameter must appear as somewhat weak!

In spite of the sinking of the middle portion, the bearing area remains great in proportion to the load. At the Parthenon, this measures on the lowest drum 2724.96 sq. ins= = 18.923 sq. ft.; the weight of the drums above it, of the corresponding portion of the entablature, of the ceiling of the portico, and of the roof is about 298,127 lbs. = 149.064 tons; consequently the load was 109.4 lbs. per sq. in. or 7.876 tons per sq. ft., while marble is only crushed by a load of 2845 to 7113 lbs. per sq. in. = 204.82 to 512.04 tons per sq. ft.

Likewise the Ionic and Corinthian columns were either constructed of one piece or composed of several drums, just as the nature of the material required. Thus for example, the columns in Aizani were marble monoliths 27.07 ft. high; on the contrary, those in Miletus, like those in Priene and Sardis, were composed of separate drums, whose flutes were only cut after setting, as for Doric columns, as shown by the shafts of the columns of the Temple of Cybele in Sardis and an unfinished column at the Temple of Apollo in Miletus. On the former are wrought on the same block with the capital and beneath the cyma the guides and endings of the flutes.

We find the same precautions on the bed surfaces of the drums, as were employed for Doric columns; only for very slender columns is iron frequently employed as a means of fastening them, as on the remains of the western wall of the Erectheion, overthrown by a hurricane some decades since, and which was decorated by three-quarter columns, and also to be still seen on the prostrate drums of the Temple of Cybele in Sardis. The iron pins were there immovably fixed in lead and tamped in the lower bed of the block to be set, then being lowered into the corresponding holes in the upper bed of the block previously set, and the melted lead was then introduced by a small channel in order to fix it. (Figs. 125, 126).

On the Corinthian Olympeion in Athens the shafts are constructed of 14 drums of unequal sizes, the capitals being in two courses, while the round bases with the square plinths are cut from a single block.

In spite of the considerable diameter, the drums are not merely set on each other in the mode previously described, as on the Parthenon and other temples, but according to the

Ionic method (Fig. 125, Erectheion and Temple of Cybele in Sardis), indeed for the same reason and on account of the slenderness of the shafts of the columns, they are connected by iron dowells. Two or four of these are fixed in a drum by cast lead and are inserted in the manner given in Fig. 127; short channels lead to the dowell holes for pouring in the melted lead.

Besides this procedure, Koldewey gives another mode of introducing the cast lead at the relatively very ancient Temple in Messa, for there the upper block was drilled through, the fluid lead being poured through the drill hole. A like system with pouring channels passing vertically and obliquely through the ashlars is also given by Bohn for the Temple of Athena in Pergamon. That by this method, if the necessary space were left, the fluid lead more certainly reached the place intended than by pouring in horizontal channels is self-evident; but tamping the lead was then impossible, though it could be done at one side in horizontal channels; but tamping is of great importance for the strength of the connection. Thus the last method is less certain and good, and according to circumstances, it is also the older one.

On the same Temple in Pergamon the places of the columns exhibit round holes with pouring channels, in which were fastened pins 3.15 ins. square; to these corresponded holes in the drums of the columns, the latter had completely rubbed bearing surfaces, so that they rested on their entire area and not merely on a border or annular surface. The slendered proportions of the columns of the later period (here the 4 th century B.C.) required the changed system.[1]

Note 1. See Bohn, R. Altertümer von Pergamon. Vol. 2. p. 22. Berlin. 1885).

The practical construction of the columns may have been as follows;-- the drums were set and roughly wrought into circular form, but the beds were already carefully dressed; for more convenient transportation and perhaps also for hoisting (setting), there were left on the external surface 4 strong bosses diametrically opposite (projecting 7.87 ins. and 16.54 ins. wide), as shown by unused and unfinished drums on the Acropolis of Athens. In this condition were these set on each

other (as shown by the frequently mentioned and never completed Temples in Egesta and Sardis), the flutes being wrought only on the lowest and highest drums for a certain length as guides, then being entirely cut only after the building was completed.

On the Ionic columns of Temple G in Selinus, the preparation of the columns in the quarry was such, that the surface was cut polygonal according to the number of the flutes, these faces being again separated from each other by fillets, that corresponded to the later widths of the fillets between the flutes of the finished column. Therefore after setting, it was only necessary to cut the flutes; all other arrangements for them having been already made.

A very complicated and detailed preparation of the flutes is shown by a never finished drum on the Acropolis of Athens (Fig. 128) and other similar arrangements at the Telesterion at Eleusis (Fig. 129). Of special interest should be the mode of joining the marble floor slabs beneath the poros columns in the cell of the Temple of Zeus in Olympia with the beginning of the flutes on the former (Fig. 95).

After the column had been carefully dressed circular with due reference to the entasis, lines drawn on its surface and extending from the upper to the lower guides traced the intersections or fillets of the flutes, the hollows then being worked out between these according to fixed templates(Fig.128). Preparations for flutes on Temple at Selinus and on the Didymaeon of Miletus (Fig. 130). Therefrom resulted their unbroken and stiffly rising course, exactly fitted to each individual drum, as well as to the varying diameters of the columns, though these differ but slightly in Attic monuments, and probably also to the unequally great entasises. These irregularities are frequently quite important in older monuments; on the Temple of Zeus in Olympia, the diameters of the columns differ from 1.97 to 3.04 ins.(in 7.22, 7.38 and 7.51 ft.), and even as much as 11.4 ins. on the Heraion in Olympia, though indeed there for other reasons. The angle columns in some temples are slightly larger in diameter than the others; yet they all stand along the upper step of the stylobate always at equal distances from its outer edge. (Compare Parthenon

and Heraion in Olympia). So slight an enlargement of the angle columns above the others, generally but a small portion of an inch for such a great diameter and small height, contributes nothing to their greater resistance and stability, so that a statical reason for this arrangement may not be assumed; on consideration of the structure, the close spacing of the columns does not without some additional reason leave any basis (which is quite impossible in many cases or must be wilfully sought) for the view, that as the angle columns stand isolated against the sky, they consequently appear of less diameter than the others, so that neither does any optical reason require their enlargement. In case of columns having a n necking with a single incision, the intersection of the flutes of the necking, worked on the capital and the uppermost adjusting drum, are separated from each other by a projecting band (scamillus) about 0.39 in. high. Both portions were nearly finished before being set, at least the upper half of the drum, and this precaution was required to prevent the angle from being broken away in being set. A similar projection is likewise found on the abacus to prevent injury of the angle, when the architrave was placed on it.

The contact surfaces of the uppermost adjusting drum and of the necking of the capital are not parallel to the upper surface of the lowest drum in the Parthenon; with a constant penetrating axis assumed mathematically, the two could not be in circles, and also no circular form was the basis of the annulets and echinus. On the eastern end, the differences in the side lines of the adjusting drums vary as follows:--

From west to east sides, taking the columns from south to north.

0.533 0.620 0.551 0.533 0.562 ----- 0.492 0.453 in.
0.315 0.289 0.207 0.114 0.045 0.249 0.232 0.533 in.

A fixed and uniform increase or diminution from the middle toward each side is as little to be based on these figures, as was found possible in the case of the lowest drums.

With the still larger upper diameter of the columns, (3.77 to 3.87 ft.) and the slight differences in the side lines, only amounting to a small portion of an inch, i.e., with the slight divergence of the beds, the ellipse would actually dif-

fer very slightly from the circular form, had not a slight deflection of the axis of the upper drum solved the problem more simply, and as a matter of course, made the surfaces circles.

However perfected the execution of the masterpieces of Iktinos was and is still so in part, yet slight defects in workmanship slipped in, such as are shown in the unequal spaces between the columns, both above and below, the different dimensions of the abacuses of the different columns and the d different heights of the columns, both above and below, the different dimensions of the abacuses of the different columns and the different heights of the columns, with the divergence of their axes, though as already indicated, some disturbances must be attributed to the explosion of powder and the destructive bombardment, which the building suffered.

In spite of the slight practical value, that these given measurements have in regard to the general execution and for our judgement of the effect of the building, we must dwell on them somewhat longer for other reasons.

On the small Doric columns in the interior of the Tower of the Winds at Athens, another peculiarity is still to be noticed, which is not elsewhere found on Doric columns; the flutes are furnished with the so-called "pipes" for a third part of their height (upwards from the base). On the low monolithic and fluted, certainly not Doric, columns of the two porticos of this monument, the flutes were lighter and better cut before setting; but to prevent injuries to the fillets and beds, the flutes were not completed at four points; the bosses between the fillets still remain visible at an inch or so above the floor (Fig. 131), which may have served for lifting them and for the use of the crowbar.

The distances of the columns from each other in the Doric order are determined by certain arrangements in the frieze;- it is normal for the axis of the column to coincide with the middle of the triglyph, and so that from the axis of one column to that of the next, there are two metopes with a triglyph between them. If the metopes are now assumed to have equal widths and a triglyph be placed at the angle, it is no longer possible for the axis of the angle column and the middle of

the triglyph to coincide; therefore the intercolumniations between the angle column and those next adjoining it on the end and side depend on this arrangement, i.e., they must become less than the intercolumniations between all the other columns, which moreover, intentionally or unintentionally, do not always show equal distances from centre to centre. Thus on the Parthenon, for example, this masterpiece of antique skill, the intercolumniations should be equal, but often vary as much as 2.16 ins., while the columns of Sicilian monuments are intentionally set with different intervals, so that the distances between the axes of the columns standing beneath the centre of the pediment are greater; the intercolumniations gradually increase from the angles to the centre in this case.

These differences in the distances between the axes of the columns evidently produce similar ones in the metopes, so that the latter can no longer have equal widths.

The the limitations in the spacing of the columns of the Doric order is opposed an entire freedom for the Ionic and Corinthian. Nothing determines this for them except the good taste of the architect. The distances between the columns vary in all these orders within the limits of 5.15 to 17.81 ft.

A comparison of the axial distances for Doric and Ionic temples is given in Fig. 132.

Vitruvius distinguishes five different modes of arranging the columns:--

1. The closely set mode (Pycnostylos); intercolumniation equal to 1 1/2 diameters of the column.

2. The more extended arrangement (Systylos); 2 diameters.

3. The still more widely spaced arrangement (Diastylos); 3 diameters.

4. The excessively wide or distant arrangement (Aerostylos):

5. The arrangement with proper proportions (Eustylos); 2 1/4 diameters; for the middle columns 3 diameters.

Our authority states in regard to 3, that the architrave breaks easily on account of the wide intercolumniations; that neither a stone nor a marble architrave could be employed in 4, but continuous wooden beams must be laid on the columns.

If we investigate the ratios of intervals to diameters of columns in Grecian monuments of the Doric order, the following values will be found for the given temples.

Monument.	Intercolumniation.	Actual length architrave.
1. Cadacchio.	2 3/5 lower diam.	7.48 ft.
2. Heraion in Olympia	1 3/4	10.78
3. Selinus, Temple D	1 3/5	14.37
4. Selinus, Temple C	1 3/5	14.63
5. Egina	1 3/5	8.53
6. Theseion	1 3/5	8.56
7. Phigaleia	1 1/3	9.06
8. Parthenon	1 2/5	13.98
9. Corinth	1 2/5	12.53
10. Selinus, Temple A	1 1/4	9.81
11. Egesta	1 1/5 to 1 1/6	13.88
12. Athens, Propyleion, middle entrance	2 3/5	17.81

Consequently neither one of Vitruvius' appellations is applicable to any of these arrangements of columns; the numbers 1 1/2, 2, 2 1/4 or 3 not being found among those given.

One would give himself up to delusions (as shown by the actual magnitudes given for the lengths of architraves), were he to judge of the actual length of the architrave extending from centre to centre of the columns from the numerical ratio of the diameter to the interval between columns, without knowing the actual diameter of the column. The architraves of t the Fountain-Sanctuary in Cadacchio and of the Heraion in Olympia appear long in comparison with other temples, if one be ignorant of the actual distance between axes of the columns or the magnitude of their diameter, and assumes a long architrave, and the use of that numerical ratio by itself led to the erroneous assumption, that with such "wide spacing" of the columns as in these two monuments, the architraves must have been of wood. This may possible have been the case, but not by reason of the assumed wide spacing!

With equal distances between axes or length of architrave, an arrangement of columns may be pycnostyle, eustyle or diastyle, while the bearing surface of the architrave is diminished

or increased, and the diameters of the columns are correspondingly lessened or increased.(Fig. 138). The eustyle arrangement may be quite bold and cause a very small stress in the architrave; merely compare the Temple in Gadacchic with the Propyleion in Athens; both monuments have the numerical ratio of 2 3/5, while the length of one architrave exceeds that of the other by 10.34 ft.

It is also an error for one to assume that the architrave constructed of common limestone required a closer arrangement of the columns,and that the use of marble first permitted a wider spacing. The Sicilian temples of limestone with a numerical ratio of 1 3/5 exhibit architraves with lengths averaging 14.44 ft., while Attic monuments of marble with ratios of 1 3/5 and 1 2/5 (Theseion and Parthenon) only show lengths of 8.56 and 15.98 ft.

According to the arrangement of the columns about the cell, Vitruvius distinguishes between the following appellations:-

a. Arrangement in antis (naos en parastasin) or ante-temple, if the end wall of the temple is changed so that two columns stand between two antes.[1]

Note 1. Antae in Latin is parastades in Greek.

b. Prostyle, if another row of columns is placed at a certain distance in front of the antes and columns of the ante-temple, and these are connected by an entablature continued to the right and left on the walls of the cell.

c. Amphiprostyle, if the same arrangement as in b is to be found in front of both pediment walls.

d. Peripteral, when the cell is surrounded by columns with 6 at each end and 11 on each side, including the angle columns.

e. Pseudodipteral, if 8 columns stand at each end and 15 at each side, yet so that the walls of the cell must correspond to the third column from the angle, and also that entirely around it a distance of two intervals and one diameter of a column remains between the wall and the colonnade.

f. Dipteral, if 8 columns are at each end and double colonnades extend entirely around.

g. Pseudoperipteral, if the walls of the temple are inserted in the intervals between columns and the area of the portico is raised and added to the cell, which thereby experien-

experiences a material enlargement.

The given number of columns, arranged in the proportion of 6 to 11 or 8 to 15 (breadth to length) is retained in the least number of monuments; a tolerably great variety here prevails; the true number is not even invariably retained at the end, as the subjoined examples show:--

Metroon in Olympia	6 to 11
Fountain-Sanctuary in Cadacchio	6 to 12
Temple on Egina	6 to 12
Temple of Zeus in Olympia	6 to 13
Theseion in Athens	6 to 13
Temple in Nemea	6 to 13
Temple of Hera in Akragas	6 to 13
Temple D in Selinus	6 to 13
Temple A in Selinus	6 to 14
Temple in Egesta	6 to 14
Temple of Poseidon in Paestum	6 to 14
Temple S in Selinus	6 to 14
Temple of Athena in Syracuse	6 to 14
Temple in Phigaleia	6 to 15
Temple R in Selinus	6 to 15
Temple of Hercules in Akragas	6 to 15
Heraion in Olympia	6 to 16
Temple of Zeus in Selinus	6 to 16
Temple C in Selinus	6 to 17
Artemesion in Syracuse	6 to 18
Temple of Zeus in Akragas	7 to 14
Parthenon in Athens	8 to 17

For accurately fixing the centres of the columns, there was employed in the Temple of Zeus in Olympia (western side) the arrangement, that in the stylobate block, which should receive the column, a hole of about a hand-breadth was cut at the middle of the bearing surface, and this was filled with lead and leveled off. On the surface of the lead was then marked the centre of the column by two lines intersecting at right angles, and it was then set. Likewise at the Tholos in Delphi are preserved such setting crosses, but scratched directly on the marble.

Antes (parastades or ends of walls) give the necessary arch-

Architectural ending to the side walls of the cell, extended beyond the transverse walls, as bordering vertical bands, narrow or of the same width as the columns and only slightly projecting from the plane of the wall; like the columns, their height is divided into three parts, also consisting of a base, shaft and capital.

The antes are so formed in plan, that the projection outwards from the side wall of the cell corresponds to the full thickness of a column, as in the pronaos of the Theseion, or it merely forms a band, very narrow in proportion to its height, as in the opisthodome of the same temple; on the side of the wall turned inward with columns between antes, the antes have a width equal or similar to the diameter of the columns (compare Egina and Phigaleia); but with a colonnade placed in front, as in the Parthenon, all projection on this side is omitted. The front surface of the pier is in all cases but an inch or so wider than the thickness of this portion of the cell wall.

The antes are required to follow the inclination of the walls and columns (Fig. 134); they are also diminished like columns in many cases and in a very strongly expressed way in the so-called Basilica in Paestum, less so and but a few inches in P Phigaleia (3 and 3.59 ins.) and on the Parthenon (4.61 ins).

On one of the temples in Selinus, the regular antes give place to a fluted three-quarter column, whose centre coincides with the centre of the wall, a less skilful solution of the termination of a wall and unworthy of imitation. (Fig. 134).

The base of the antes is generally formed by the projecting lower course, and it accordingly receives the same treatment as the lower part of the wall itself; with a richer treatment of that, a lower base is used (reverse ogee with narrow band), returned around as on the Theseion.

The surfaces of the antes remain absolutely pain and without ornament; only the fine bed joints of the courses of stone intersect them, being continuous with the joints of the end walls.

The capital of the antes in respect to form has no relation to that of the column in neither the Doric nor the Ionic order. It is rather heavily treated on the earlier Sicilian tem-

temples; the uppermost course slightly projects beyond the surfaces of the antes and is decorated by a recurved leaf-moulding with a thin abacus above it; on the buildings of the perfected style, fillets or narrow bands below the projecting leaves are added to this profile, and a delicate crowning moulding is added to the abacus. The ornaments of the different portions, originally only painted, were sculptured in relief in the Alexandrine period.

A peculiarly archaic and heavy treatment is shown by the a ante capitals of Paestum, while those of Phigaleia exhibit the most aspiring and freest forms (Fig. 134).

On the stone temples the antes are wrought on the ashlars of the cell and are coursed the same as those.

The antes on the Heraion in Olympia were made of wood, since the upper portions of the walls of the cell indeed consisted of unburnt bricks, which required especial protection at a free ending. Arrangements on the floor and the lower courses of ashlars (Figs. 135, 136) afford assured evidence of this. Anchor holes are cut in the thresholds and double dovetail grooves are cut in the lower ashlar course to receive i inserted strips to hold the board wainscoting and protect it from injury. (Grooved-in cleats, such as we have on our drawing boards and table tops, were already known to the ancient Egyptian joiners, as shown by some small wooden chests in the Gizeh Museum at Cairo. Also see the succeeding volume of this Handbuch.). The vertical grooves in the stone are further cut wider at back to prevent the springing of the projecting bo boards.

The form of the stone antes as narrow wall bands is perhaps connected with a reminiscence of the ancient construction in wood, from the period in which the mixed mode of building in masonry and wood was in use.

The primitive form of the commended ante capital at Paestum is also to be found on ancient rectangular steles. The cymatimu (ogee moulding) first occurs on the works of the later time and of the best period, and its invention dates back to the 7 th century B.C., according to Puchstein (page 52, 53), (between the erection of the Treasury of the Geloans and that

of the Great Temple in Selinus). It first occurs on clay objects and in architecture on the wooden and stone members covered with terra cotta (Metapontum, Olympia, Syracuse, Selinus), and thence finds its way into stone architecture. On the contrary, a very ancient structure near the Marmaria at Delphi shows the angle of the wall without any vestige of an ante, with the construction of the wall as in Fig. 137. The corresponding corner of the architrave is composed of stones dressed with the pick, together with the underlying ashlars of the cell. Therefore the tradition of an ante originally of wood was lost at a very early time; on the other hand, the hollowed-out angle stones recall the similar blocks in the Palace at Knossos on Crete!

For all three orders, besides the entire columns, there also occur three-quarter columns, for example at the angles of pseudoperipteral plans -- Temple of Zeus and Tomb of Theron at Akragas, as well as on half columns before the cell walls of the same structures, the south front of the Erectheion and the walls of the Choragic Monument of Lysicrates at Athens etc., which are mostly coursed, like the walls of the corresponding cell walls. Detached from the masonry and attached in pairs to rectangular free piers, they are employed at the Great Tomb in Mylassa and in the same manner at the Gymnasion at Epidauros. While in Mylassa simple square piers come into use at the angles, at the Agora and on the Prytaneion at Magnesia-a-M, the half columns with their axes at right angles are connected with the square angle pier.

Three-quarter columns connected in pairs and belonging to the Ionic order were found in Klazomenai (original blocks in Pergamon Museum in Berlin), and connected in threes, of the Doric order, were on the so-called Princesses' Building at Pergamon (likewise in Berlin). These were probably suggested by Egyptian or Assyrian models (compare Egyptian clustered columns in Beni-Hassan [1]) and by the great piers of four connected columns, built of bricks, whose beds are covered by cuneiform characters, in the Asian section of the Louvre Museum in Paris(Fig. 138).

Note 1. See Die Aegyptische Pflanzensäule by Ludwig Borch-

Borchardt. Nymphea Lotussäule. p. 7. Berlin. 1897.

Three-quarter columns of the Ionic order, attached to the edges of thin rectangular piers were employed on the Altar structure in Pergamon.(See Fig. 138; original blocks in Pergamon Museum in Berlin). Capitals and bases are imitated from those of half columns and the surfaces of the shafts are fluted.

Coursed, coupled or double antes are to be seen on the north portico of the Erectheion in Athens; coupled square piers joined by a panel are found on the Propylon in the east portico at Magnesia-a-M.

Piers of T-shape with projectink half columns occur on the prosceniums of the theatres in **Priene, Epidauros** and other p places.

Allied to the antes on one of the temples at Selinus, rectangular projections terminate the walls in the interior of the cell of the Sanctuary at Phigaleia, in the form of Ionic half columns.(See Fig. 138).

Likewise here is an abundance of diversity in the forms and technical execution according to the needs, nowhere being pattern work or a narrow range in movement or imigination, which Grecian architecture is frequently charged with cultivating, and whose treasures of form are believed to be exhausted by the representations in Mauch's plates, and the canonical forms of columns and entablatures therein included are given out as being the soul of Grecian architecture. The variant forms a are as numerous as in the preceding and the succeeding historical styles, therewith being chiefly well reasoned and refined, -- yet we must know and understand them! If then without prejudice, we compare with them our newest and most recent works, the artistic monsters produced by our high and low cultured rabble! For subdividing the wall surfaces are arranged at definite places slight projections bonded with the walls of the cell, corresponding to the forms of the selected order, that exhibit the like triple division and coursing as the columns, piers and antes,(Akragas, Priene, Miletus), except that for the Ionic order occurs the bolster capitals with small volutes and rich ornament instead of the cove or band capital. (Miletus).

The shaft is smooth, or there occurs as an innovation an e enclosure with a sunken panel left without ornament, except the inscriptions occasionally engraved thereon are to be so regarded.(Hadrian's Gate, Monument of Philopappus in Athens and Portal at Mylassa). A later period also adorned the panels with rich ornaments.

On the free pillars rested the entablature, composed of architrave, frieze and cornice, above this being the ceiling and the roof. The latter was constructed of stone beams and stone slabs or was paneled in wood. Wood was retained as the material for the protecting gable roof from the first beginning until the latest time; wooden rafters supported burned clay tiles or marble slabs, sheltering the interior from injuries by weather. The architraves are either monolithic (Temple F in Selinus, according to Puchstein) or are composed of two or three blocks in width.

For marble monuments these mostly have equal widths; for those of porous limestone, that received a coating of stucco, frequently occur differences in dimensions,so that for example on the Temple of Zeus in Olympia, the three architrave blocks beside each other measure 2.56, 1.67 and 2.33 ft. in width.T The separate beams touch along borders about 2.36 ins. wide, while the rest of the surface is roughly sunk with the point, frequently so much that the distance at the middle between the blocks amounts to 9.45 ins. (Propyleion at Athens). The strength was not reduced by this stonecutting or preparation, but a more accurate and better jointing was more easily secured.

The height is also divided in courses for the architraves of the gigantic Temple in Akragas [1] and for an entablature found on the street of the treasuries at Olympia; the separate courses have the considerable heights of 3.94 and 3.28 ft. in the first case, while they are but 1.10 ft. high in the second, with a width of 2.26 ft. (Fig. 139). Of two courses in height is composed the architrave for temples C and D in Selinus, according to Hittorf, as well as that of temple T.

Note 1. Hittorf, Pl. 89 and p. 309, found square grooves on the under surfaces of the lowest architrave blocks, which

extended beyong the greatest projections of the capitals. He believes that marks of rust were discovered in these grooves, and concludes from this, that iron bars were inserted in them, since the stone alone was not in condition to support the stones lying thereon.

The stones of the Olympian entablature only touch on margins of the horizontal bed surfaces, so that the beds of the separate blocks are barely covered at the margins. On the Temple of Demeter at Paestum, the crowning ogee moulding is not cut on the same block as the architrave, but on separate stones, laid on the other. The external architrave blocks abut against each other at a right angle; the internal ones join obliquely, being mitred at 45°.(Fig. 139; also Egina and Olympia).

The separate blocks are carefully held together at the abutting joints by iron T-cramps set in cast lead (like the stones of the cell walls); they generally rest freely on the columns without the use of any means of fixing them. (Fig. 140; anchoring of the architrave of Temple of Zeus in Athens).

The greatest stress in the architrave beams may perhaps occur actually on the blocks over the middle passage of the Propyleion in Athens. This architrave consists of two parts and is 17.82 ft. long, its width is 2 × 2.36 ft. = 4.72 ft., and its height is 3.77 ft.; so that it has a sectional area of 17.83 sq. ft. The volume of the frieze, cornice, tympanum and pediment cornice amounts to (4.72 × 17.82 × 13.48 ft. high) = 1133.7 cubic ft., one cubic fta of marble being assumed to weigh 168.55 lbs., whict gives 191,150 lbs. as the loading of the architrave, which has at each end a bearing of about 24 inches.

Frieze and architrave in certain cases are wrought from a single block, as shown by Fig. 141 from Epidauros, where no attention is paid to through joints. The architrave, frieze and cornice are vertically connected by iron dowells, lengthwise and sidewise in different works by iron cramps set in lead.

The Doric frieze is composed of triglyphs, metopes, filling blocks and smooth frieze slabs on the inner side (Fig. 141),

is neither executed uniformly in stonecutting, in coursing, nor in bonding. As for the architrave, it is normal to have one stone in height, with the setting of the triglyph blocks, the recessing of the metopes, the arrangement of small piers behind these, and a smooth and continuous frieze course with the height of the triglyphs, all carefully connected by I-cramps. This is especially true for the marble structures of the Doric order in the best period.

But exceptions are also not lacking here, for example, the great Temple of Poseidon at Paestum has a high frieze in two courses, whose lower portion is wrought as headers, while the upper one shows masonry in two courses behind it. Since the Temple was covered by stucco, the jointing then played no part. (See Division VI).

On the ancient Temple of Athene on the acropolis of Athens, the roughly dressed triglyph blocks are channeled slabs clamped together by dovetails. (Fig. 142 [1]).

Note 1. See Die archaische Porosarchitektur zu Athen by Th. Wiegand. p. 8. Cassel & Leipzig. 1904.

At temples R and D (Hittorf), instead of blocks behind the metopes were two courses of masonry, and one of the temples at Akragas were even three courses, where further the metope consisted of a single block, while at temples F and G, the metope slabs were composed of two pieces in height.

At the Sanctuary of Demeter in Paestum, the triglyphs were inserted and the frieze blocks abutted at the centre of the metopes (Figs. 141, 143), a jointing also retained on the Tholos in Delphi, excepting that these were not cut as separate blocks.(Fig. 142).

According to various publications,it was heretofore assumed, that the construction of the frieze of the Parthenon was executed with scholastic regularity. But the discoveries during the latest work of consolidation have again shown, that the Greeks were likewise economical of their stone for this masterpiece of theirs. They saved it, wherever possible, as appears from Fig. 144, that reproduces in general the stonecutting and the connection by cramps in an authentic way, according to the measured drawings of Mr. N. M. Balanes in Athens,

chief engineer and director of the work of strengthening the Parthenon, most kindly transmitted to me.

The distribution of the triglyphs in the frieze is then such, that one comes over each column and one above each interval, the centres of the columns and triglyphs coinciding in one case and those of the intervals and triglyphs in the other; an exception is only made in case of the angle column, since a triglyph always forms the angle of the frieze. The triglyphs and metopes usually have equal widths among themselves; if these are to be retained and carried out in the frieze, t the mode of arranging the columns will necessarily depend on the subdivision of the frieze. Under this assumption and with the use of an angle triglyph, there must be a smaller i interval between the angle and next columns, than between the second and third or third and fourth.(Fig. 145).

If the resulting unequal intervals between the columns are to be avoided, only two methods exist; to make the metopes next the angle, or these and those next succeeding, wider than the others, or to give up the angle triglyph, the latter being usually preferred in Roman art and in that of the Renaissance, in order to make equal distances of the columns from each other possible, and to produce no disturbance in the frieze.

On Sicilian monuments, as already mentioned, where the intercolumniations are all different, i.e., increase towards the middle, it is self-evident that the metopes are likewise of different widths; differences in dimensions also occur at the Parthenon, produced by inaccuracies in the arrangement of the columns and in the execution; for the same reason, the regulas and drops are not always exactly beneath the triglyphs. For example, the second on the eastern side, counting from the southeast angle, is displaced about 5/32 inch. These petty irregularities in the Attic masterpiece must not be confounded with the intentional ones on Sicilian monuments.

Three solutions are then possible in the treatment of the frieze:--

1. Metopes and triglyphs equal among themselves, using the angle triglyph, then unequal intercolumniations.

2. Triglyphs equal, but metopes nearest the angle larger, retaining the angle triklyph, then with equal intercolumniations.

3. Metopes and triglyphs each equal among themselves, with equal intercolumniations, the angle triglyph then abandoned, a half metope being employed at the angle. (Fig. 145).

The last solution is not employed on any Grecian monument; it was indeed assumed for the Temple of Demeter in Paestum by Delagardette; but I may doubt its correctness.

Vitruvius terms the solution defective "whether made by lengthening the metopes or reducing the intercolumniations", and it results from this that the ancients had in the course of time avoided the use of the Doric order in their temples. With the abundance of Doric monuments, which originated in t the best period and were still built until the period of decline, this principle of Vitruvius appears somewhat singular; Vitruvius indeed quotes the evidence of some ancient architeects,of Tarchesios (otherwise unknown), of Pythios (builder of the Temple of Athene at Priene), and of Hermogenes (builder of the Temple of Artemis at Magnesia), as saying that on account of the defective and inharmonious proportions of the members, no more great temples of the Doric order should be erected.

The normal distribution of the triglyphs shown as being usual for Grecian Doric temples with closely set columns, Vitruvius designates as "monotriglyphic", i.e., with one triglyph above each intercolumniation (Book IV, Chap.3), in contrast to those with two or three triglyphs for each intercolumniation of buildings with widely spaced columns.(Compare t the central passage of the Propyleion and that of the Market Gate at Athens).

The Artemesion in Syracuse with closely set columns shows at the ends greater intercolumniations than at the sides. A normal division of the triglyphs and metopes is impossible, an approximate one being so, only when the two metopes at the right and left of the ridge line of the pediment were made c considerably wider than the others. The eye might still bear such an enlargement, but only two solutions would be possible

for the sides (I and II of Fig. 146); either the triglyph is omitted over the intercolumniation, or disproportionately narrow metopes and triglyphs are assumed. Both are equally ugly. A last expedient would be to deny the triglyph frieze on this Temple, since it would harmonize little with the heavy architecture.

Another and a fourth solution could also be found in the projection or recession of the angles of the architrave at the angle columns. In the fewest cases, the angles of the architrave joining the sides and ends of the temple lie vertically over the external line of the uppermost drums of the columns. The corners project more or less or are even set back from this, according to the form and projection of the echinus capital. On the Temple of Poseidon at Paestum and the Artemesion at Syracuse the angles of the architrave coincide with vertical planes tangent to the uppermost drums of the angle columns; on the Temple at Egesta and on the Temple of Apollo at Metapontum, these scarcely differ by 3/8 inch; on the Temple of Apollo on Ortygia, the front surface of the architrave project about 7.09 ins. beyond the tangential plane mentioned, likewise on the Basilica (enneastylos) and the Temple of Demeter (hexastylos) at Paestum about 3.15 ins., on the Tavole Paladini at Metapontum about 1.38 ins., over 7.09 ins. on the Temple of Athene on Ortygia, about as much for a temple in Selinus, on the Temple of Juno at Akragas about 5.51 ins., about 4 1/2 parts on the Parthenon in Athens, and about 17 parts on the Theseion there. On Temples C and D in Selinus, the angle of the architrave is set back about 1.97 ins. etc. (Fig. 147).

Therefore the lengths of the architrave are extensible magnitudes, even if but moderately so, yet are still such. The variation for temples of medium dimensions varies between the limits of - 1.97 ins. through 0 to + 7.09 ins., then up to 18.11 ins. for the entire length of a (pediment) end. Making use of this freedom, i.e., based on the maximum of the total length of the pediment architrave, for example on the Artemesion at Syracuse, the treatment of the frieze became more uniform, permissible, and harmonizing more with the temples otherwise known.

The strongly projecting Doric slab capitals of soft material did not permit for purely technical reasons the projection of the architrave beyond the tangent plane of the uppermost drum. It was only made possible in the time of the best period, when the steep echinus was in fashion and dense limestone came into use. Perhaps optical reasons contributed to the procedure (See Plato's Sayings, Chap. VI); by projecting the surface of the architrave toward the edge of the abacus of the capital, men desired to conceal as little of it as possible.

Since the marks of the derivation of the triglyph frieze on existing monuments of stone from any other mode of construction were lost in consequence of the change of the ceiling of the portico, and the frieze thereby became already in the earliest period of the stone temple merely an ornamental accessory, there remains for its explanation only the assumption, that historical traditions and recollections of an architecture, that long since disappeared, for otherwise its function in the building cannot be explained. [1]

Note 1. Finally, how little the original connection between the structural and the ornamental form of the Doric frieze may be understood is proved by the arrangement of the triglyph frieze on the Arsenal of Philo, with which are then contrasted the two-story stoas in Athens and Pergamon.

If we believe in a preceding wooden construction, then is Dieulafoy [2] right, when he says that the triglyphs are wider or enlarged dentils (explained as the ends of beams, as visible in Lycian tombs), whose dimensions were fixed by those of the cross beams, which again depended upon the weight of the roof and of the covering material. Then is the triglyph frieze the changed form of the dentils, [1] and the use of one ornament would exclude that of the other on the same building. And yet we find (Figs. 5, 6, p. 11) on truly ancient terra cottas of lower Italy and Sicily triglyph friezes and dentils over each other! The late period indeed did the same (see Pergamon and other places); yet we must not take this into account here.

Note 2. Dieulafoy. p. 66.

Note 1. See Göller, p. 78.

In explanation of the triglyph frieze, Vitruvius says (Chap. II - 4); "if one be of the opinion that where triglyphs are now found, there were openings for light, one should for the same reasons believe also that the dentils in Ionic buildings have taken the place of windows. For the intervals on both sides, both between the dentils and also between the triglyphs, were termed "metopes"; for the Greeks call the places of beams and poles "opai", as our countrymen term these holes "dove-holes" (columbaria). Thus the intervals between beams, which are found between two of their positions (opai) are termed "metopes" by them."

Hence the opai are holes in the masonry for beams, or in modern language, "holes for through beams", but in wooden construction are the places at which the ceiling beams rest on the architrave.

Therefore in one case the metope is a piece of masonry between two holes for beams, to be filled later, but neither in the completed stone or wooden framed construction is it a hole or a small window.

According to the usage of the Greek language, the word "metopon" denotes the part over the root of the nose and between the eyes, thus a solid body, a division between two openings. It is used in this sense in the building contract for the Arsenal near Zea [2] (Contract of Enthydomos, son of Demetrios of Miletus, and of Philon, son of Exekestes of Eleusis, for the erection of an arsenal near Zea), for there "metopon" signifies a strong pier or door-jamb, especially the mullion at the centre of a double doorway, a division between two openings.

Note 2. Corpus Inscriptionum Atticarum. II; 2, No. 1054, lines 22-26. Berlin. 1883.

The passage in question runs thus in the original.(See the text in Durm). Two translations or interpretations of it lie before us, one by Choisy [3], the other by Bohn.[4]

Note 3. Choisy, A. Etudes sur l'Architecture grecque. Ire. Etude; L'Arsenal du Piree. Paris. 1888. Also Fabricius in Hermes, 1882, p. 570.

Note 4. In Centralblatt d. Bauw. 1888. p. 296.

By Choisy:- "reserving on the width of the arsenal doors to

the number of two on each side; width nine ft. And on each side between the two doors, build a dividing mullion having a width of two ft. and set ten ft. toward the interior. And carry to the first pillars the wall, against which opens each of the two doors."

By Bohn:- "but openings for doors at the ends are to be left, two of those at each end, nine ft. wide. But on both sides shall a space be arranged (metopon) between the doors (their walls ?) two ft. wide, but to project inward two ft., the wall shall bend around to the first columns, and also each one of the leaves of the doors to open against it."

Choisy's interpretation is correct and that of Bohn is not; the point will be more easily understood by means of the sketch in Fig. 148 according to Choisy's views, who should more properly have used the word "openings" instead of "doorways". "Buraias" (openings for doors) seems to have been intentionally written the first time, and "duron" (doors) the second time. For only by means of the end wall inserted at the centre, -- the metopon -- were there two doors!

As in Vitruvius the metope is the piece of masonry between the holes for two beams, so is it also with the Athenians the strong dividing and supporting pillar between two openings for doors, and if Vitruvius excludes the assumption, that the triglyphs were windows, according to him and the preceding Grecian building contract, the metopes were still less window openings! Triglyphs are indeed mentioned twice in the contract of Philo; but they are never opposed to metopes.[1]

Note 1. "Metope" otherwise briefly signifies "face" or "front". "Metopon" and "metopou" are to be understood in this sense in the building contract for the Athenian walls. (Corp. Inscr. Att. II. Berlin. 1877. No. 167, lines 40, 66). It there simply means "front."

In the building inscription of the Asklepion [2], the structural parts above the columns do not receive the names otherwise current, but:--

The architrave is designated by "to stroma."

The frieze by "poistasis"(what sits on the architrave).

The cornice with the stroteras and calymmatias by "stora."

Note 2. See Baunack, J. Aus Epidauros. Eine epigraphische Studie. Leipzig. 1890.

The complex jointing of the Doric frieze gives place to the simplest conceivable for the Ionic and Corinthian orders. On the monolithic architrave, or one composed of several slabs, lie the long frieze slabs, either plain or decorated by figures, connected by cramps, perpendicular to them being the wood or stone supporting beams of the ceiling with smooth filling blocks inserted between them.

On monuments of the Ionic style, that more closely adhere to a preceding wooden construction, a frieze is in general doubtful. (Athena Polias at Priene, Caryatid portico of the Erectheion, Tomb of Nereids in Xanthos, in which the architrave is adorned by a figure compositionl like the Temple in Assos). The two Figs. 149, 150 reproduce the entablatures of the Temple of Athena Polias in Priene and that of the Artemesion in Magnesia-a-M from the original fragments, and they exhibit the jointing of the entablature on the assumption of a marble coffered ceiling and of a beam ceiling with sheathing and strips planted thereon.

The crowning principal cornice remains in meaning the same in the construction of all three orders; a single, strongly projecting slab, which protects the underlying portion of the entablature from wind and weather, and ties together the masonry in the theckness of the wall, whereby the ashlars are strongly connected by dowells and cramps.

The strongly undercut water drip is common to all, equally whether beset by mutules (Doric) or whether continued in a b beautifully recurved line from the sharp front edge to the ogee leading to the flat surface (Ionic, Corinthian). The anathyrosis (recession) is everywhere carried out on abutting surfaces, but in its location regard is not always paid to the ashlars of the frieze lying beneath it. For example, the end joints on the Parthenon coincide at one side with those of the triglyphs, and in Egesta they are correctly bonded and meet at the middle of the triglyphs and metopes. That the t triglyphs are to be regarded as structural and as merely the supports of the cornice slabs is therefore incorrect.(Fig.151).

For porticos, the coffered wooden ceiling or that decorated by strips long maintained itself. The bearings of the wooden beams are everywhere recognizable on the buildings, so that fixed starting points for their former existence are obtained. For the construction of stone ceilings, the beams are either still in place, or their assured parts lie on the ground.

As characteristic may first be emphasized their position in height. In Doric buildings, they lie above the slab with the drip moulding, but for the other orders, they commence directly above the architrave.

According to construction, they are divided into coffered ceilings of stone slabs (sides of the Parthenon, caryatid portico of the Erectheion), and those constructed of stone beams on which rested coffered slabs (ceiling of opisthodome of the Parthenon, ceiling of north portico of Erectheion). A greater simplification is exhibited by the last arrangement, when in place of the strong coffered slab, thin perforated ones occur, whose square openings are again closed by small hollowed covers.(Temple of Theseus in Athens). Fig. 152 gives a representation of the different stone ceilings of the Parthenon, F Fig. 153 is such of the Erectheion, and Figs. 154, 155 are t those for the porticos of the Temple of Theseus.

The beams are in part fastened by iron dowells, and are connected with the intermediate blocks by I-cramps, but are arranged without regard to the location of the columns, as shown by the ceilings of the Parthenon, the Theseion, that of Temple of Nike Apteros, and of the Temple in Phigaleia.(Fig. 150; plan of ceiling).

A representation of the characteristic construction and subdivision of the stone ceiling by beams, stroteras and calymmatias is given by Fig. 157, after the still existing structure at the Theseion in Athens.

From the preceding standards differ the ceilings on the Monument of Nereids in Xanthos, where the merely ornamentally indicated small beams are wrought from a single slab together with the panels (Fig. 158), and then that of the Tholos at Delphi, that at Epidauros (Fig. 159, 160), and still others. Also in a quite peculiar way, that of a Tomb in Mylassa, where stone beams extending parallel to the diagonal alternate in

height, reaching to the flattened apex of the structure.(Fig. 161 and its derivation from wooden construction).

Unfortunately no vestiges of the ceiling of the cell are now preserved, and no monument throws any light on what it was, of what material it consisted, and how it was constructed. The complete lack of the structural portions appertaining thereto in the ruinous condition of ancient temples, permit it to be safely assumed, that these ceilings were of perishable materials, and the knowledge of so many conflagrations of temples, that they were made of wood. Not proven for most is the law, that on account of its considerable span, the central space of the cell could be covered with wood alone.

The middle aisles of the temples on Egina, in Phigaleia, and of the Heraion at Olympia, measure 10.73, 14.47 and 12.47 ft.; architraves and stone beams in lengths of 14.63 ft. (Temple C in Selinus), 13.98 ft. (Parthenon), 17.82 ft. (Propyleion), etc. occur as sufficient, both constructed of common l limestone as well as of marble. The possibility of a stone ceiling then existed in case of the given widths of centre aisles, even though I may doubt its use.

A passage of Pausanias in reference to the Heraion in Olympia gives some points in regard to the arrangement of the ceiling and the roof.

During repairs made to the latter, "the corpse of a heavy-armed soldier was found between the two ceilings, one of which was for ornament, the other for supporting the roof." It results from this, that a decorative horizontal ceiling covered the cell, and an empty space existed between this and the pediment roof. In the construction of the closed ornamental ceiling, transverse beams were probably first placed at fixed intervals, then crossed at right angles by longitudinal beams lying on them, the interspaces being again divided in panels by short beams and closed by board panels above.

Coverings with variously painted terra cotta enclosed the beams on three sides like cases, or with noble metals and paintings may the effect of splendor have been produced on these decorative ceilings. Pausanias mentions in Athens " "chapels with gilded ceilings, decorated by alabaster and

paintings;" wooden beams and calymmatias are mentioned in the era of the Diadochides as entirely gilded and ornamented by ivory and mosaic work.

Above the entablatures of the ends rise the pediments terminating the gable roof, and whose masonry exactly follows the line of the roof. For the pediment walls constructed of shelly limestone are horizontally coursed and bonded together, like those of the cell. Since the front surface was plastered, it was not necessary to devote any special care to the jointing. The uppermost course of stone ended horizontally to receive the pediment acroteria (Parthenon, Theseion, Paestum and the Sicilian temples), which was dove-tailed into the inclined coping stones, but at the same time rested on the course beneath. For marble temples (Parthenon, Theseion), the pediment masonry was covered by marble slabs, that extended with through vertical joints from the bottom to the inclined cornice, omitting horizontal joints, and was clamped to that. (Figs. 163, 164. Egesta, Parthenon and Egina).

If figuee decoration in the tympanum was foreseen, then its face was set back from the true vertical plane of the entablature in order to secure more space for the setting of the figures, as well as to reduce the weight of the pediment.

On the Temple of Concord at Akragas (Fig. 165), above the horizontal pediment cornice was arranged a plain step as a plinth for the figure decoration; a design that had its model in the old Temple of Athena (Hekatompedon) on the acropolis of Athens,-- "where the group of Tritons stood on a special base 8.66 ins. high. [1] This base for figures is again abandoned on the Parthenon.

Note 1. See Th. Wiegand's beautiful and model publication: Archaische Porosarchitekturen der Akropolis zu Athen. p. 23, 152. Berlin. 1904.

The temple roof (aetoma) forms the external protecting covering of the building; constructed as a low gable roof, its two roof surfaces intersect on the middle line of the structure and conduct the rain water toward the sides. We indeed no longer possess any direct data on the construction of the framework of the roof, since from the perishable nature of the wood and materials of which it was composed, no remains

at all are preserved to us; yet we can decide on its original form with tolerable certainty from the covering materials preserved, from the holes cut in the stone cornices of different temples, and from building contracts.

The framework of the roof was constructed of inclined rafters and of purlins parallel to the eaves; the purlins could then rest on the pediment walls and also on the transverse walls of the pronaos and posticum, which were indeed usually extended up to the rafters, as may still be seen on the so-called Temple of Concordia in Akragas, An opening at the middle of this upper wall made possible unrestricted access thereto. Also the rafters might rest directly on the longitudinal walls of the cell, carried up to the roof surface, as Hittorf restored Temple R at Selinus, for example.

A construction with horizontal rafters, as assumed by Viollet-le-Duc and also by Hittorf for another temple, and that has always been used in the south until the present time, may have likewise existed.

Sheathing seems to have never been used; the tiles were then either hung on horizontal purlins by their projections, or were directly laid on the upper surfaces of inclined rafters.

In Phigaleia were assumed a ridge purlin (compare also the roof of the north portico of the Erectheion) and two intermediate purlins, that rested on the different pediment walls; on these lay the rafters resting against each other at top, cut in dovetail form at the lower ends and resting in gains cut in the geison.

The rafters were placed about 2.08 ft. between centres; the height of the roof in most temples amounted to between 1/7 and 1/8 the width of the temple measured above the architrave.

Since the rafters did not extend down over the geison, the inclination of the roof must either be worked on this from the ends of the rafters outward, or as frequently the case, a separate inclined piece must be laid on it, and which then ended in front in the form of an ogee moulding. If cymatiums extended along the sides, they were on the inclined pieces; in other cases the roof tiles rested on them.

Interesting points on roof construction are given by various ancient building contracts, which indeed do not primarily

apply to the roofs of temples, but to those of secular buildings. Here is again the previously mentioned building contract for the Arsenal of Philo. (Lines 45-58). The passage in question runs thus:-- [1] (See Greek text in Durm).

Note 1. Corpus Inscrib. Attic. II. 2. No 1054. Berlin. 1883.

Translated into German and thence into English:--

"Set capitals of Pentelican stone on the piers. On these rest wooden architraves, which are fastened to the pieces and are 2.5 ft. wide and 2.25 ft. high, measured from the highest point, 18 in number on each side. (The architraves, which are regarded as purlins, are dressed off on top to the slope of the roof). Place intermediate beams over the middle passage on the piers, equal to the architraves in thickness and height. On these lie longitudinal beams (here ridge purlins) 1.75 ft. wide and 1.75 ft. high, exclusive of beveling, under which are wooden caps 3 ft. long and 1.5 ft. thick. The purlins are to be fastened with pins on these and on the intermediate beams. On these rest the rafters (sphekiskoi) 0.63 ft. high and 0.94 ft. wide, at distances of 1.25 ft. apart; lastly, on these are to be boards (calymata) 0.06 ft. thick and 0.38 ft. wide, fastened by iron nails; after these are coated (dorosas, with clay and straw), the roof will be covered with Corinthian tiles, one tile looking over another." [1]

Note 1. Bohn's translation (Cent.d.Bauw. 1882. p. 295.296) omits some important words, especially "dorosas", the covering of the sheathing of the roof (with clay and straw). "Pier is preferable to "column". The restoration of the section is n neither satisfactory nor acceptable.

We deduce from this, that the roof was constructed with inclined rafters, and that in the three-aisled interior the vertical supports of the purlins were stone piers, that the arrangement of a ridge purlin resting on a wooden cap and the strong transverse beam beneath this was chosen, and that the feet of the rafters did not rest on a plate, but were let directly into the ashlars of the cornice; further that on the rafters was laid a sheathing coated with clay, on which the clay tiles were set. (Fig. 166; after Choisy's restoration).

Note 1. With the restoration by Choisy, that published by Fabricius mostly agrees. (Die Skenothek des Philon, das Zeug-

Zeughaus des Attischen Marine in Zea. Hermes. Zeits. f. Class. Phil. 1882. p. 551-594). The clear and excellent interpretation of the text, which Fabricius gives in his essay, will be read by every practician with pleasure. Except that the surprising statement is made (p. 582); "It is well known that no other mode of fastening the tiles, especially that by nails on the rafters, occurred in antiquity," -- while yet the Lex Puteolana expressly requires the nailing of one row of tiles with iron nails.

Less clear is the case in the contract for the restoration of the Athenian walls[2](Corp. Insc. Attic. II. 1. No. 167), Which Choisy[3](in his Study:- Les Murs d'Athenes. Paris. 1884), treats in a truly ingenious but not entirely satisfactory manner. He takes up the matter as too beautiful and too artistic, when it concerns the repairs to a fortification, that has fallen. Therefore his translation and interpretation of the lines 63-73 do not correspond verbatim to the Greek. As for the top of the wooden ceiling (Fig. 167), he may be followed, though not without objection, since it is not definitely stated, that the pier must be carried to the same height as the wall, and a projection of the beams beyond the wall and piers is not specified. But in the passage (see original text in Durm) occurs an interpretation, which it is still harder to accept. He arranges work, that can only be performed after that described later has been completed. He first requires on the beams of the ceiling or roof a superstructure of unburnt bricks or pise, and after this the substructure, i.e. the supporting sheathing and the beams to prevent sliding. But the addition of the rather modern, bomb-proof, mass of earth (M in Fig. 167) above the woodwork of the ceiling is not mentioned in the specification, and this work is so great and so important, that one would not have forgotten to mention it. Choisy assumes all succeeding work to be on both sides, but nothing of this likewise remains in the building contract. This double work would not have been omitted by a Greek in the letting of work.

Note 2. See Corp. Inscr. Attic. II. 1. No. 167.

Note 3. In his Study:- Les Murs d'Athenes. Paris. 1884.

C. O. Müller assumes a shed roof instead of Choisy's gable

roof, and longitudinal beams from pier to pier instead of the transverse beams, which correspdonds better to the conditions, according to our opinion. The passage cited reads as follows, plainly translated:--

- - - "After he has made ready the wooden framework of the ceiling, he will set on the wall the straight geison of the cornice, projecting sidewise 1.5 ft., and will set on this the upper piece of the cornice (akrogeison), true and plumb, 7 ins. wide 1 palm (handbreadth or 4 fingers = 3.5 ins.) thick, while he cuts out on the inner side the thickness of a board and d dresses off the top in accordance with the slope of the roof. He will lay on the inside boards 1 in. thick and 5 ins. wide with intervals of 3 palms (10.5 ins.), and (fasten them) with iron nails. And after he has thrown upon them plastering reeds (dry reeds, the canna of the Italians) with an under layer of chaff (pieces of reeds or chopped straw) or reeds, he will cover this with straw to the thickness of 3 ins. And he will cover the entire extent of the enclosing walls with Laconian tiles, and he will set the hegemones, where they are wanting, entirely in clay, flush with the face of the wall. And he will set the covering tiles entirely on a bed of clay.

And he will mould the outside with a Corinthian cymatium, while he trims off the ends of the beams properly, and sets the former exactly in the plane (of the Wall) and plumb---."

In the now defective inscription is also mentioned a coating with clay and straw, though this work does not appear in the details. Choisy's drawing could scarcely be derived from this, and we are then poorer by oni idea in construction, by the tile roof without rafters, which is likewise followed by Dieulafoy, and has its result in the convex clay and straw roof of the early period (Francois vase). But here is likewise certain the "δορωσει πηλω ηχυρωμενο" --the covering of the sheathing with clay and straw and the bedding of the tiles in this.

If the interpretation of the very defective inscription in reference to the rebuilding of the city walls of Athens [1] by Choisy [2] be correct, a longitudinal timber (N) of fixed height was required above and along the ceiling beams projecting along the face of the wall, which, after the slope of the roof

had been formed, had to prevent the slipping of the pise piled up in form of a gable roof or of unburnt bricks (M, Fig. 167). The gable roof of pise occurs here instead of the flat or low domed clay roof, while the precautions against sliding of the mass of earth remain the same.

Note 2. Discovered in 1829. See Bull.d.Inst. Arch. March 1835; -- also see Müller, C.O. De munementis Athenarum etc. Göttingen. 1836.

Note 3. In Etudes epigraphiques sur l'Architecture Grecque I re Etude; Les Murs d'Athenes d'apres le devis de leur restauration. Paris. 1888. Sect. 60-65.

If in this structure of the last years of the 4 th century B.C. (306-303) an ancient construction of the cornice is imitated, and it has not rather resulted from the peculiar purpose of the building, the ground form of the translation into stone would be found, although not for decoration, for which all data are lacking.

The angle block of the cornice of the Treasury of the Megareans found in Olympia (Fig. 168) shows us how the basal form is to be kept separate from the ornamental form. For the use of the often very rich and beautifully decorated front protecting tiles as facings for ends of ceiling beams affords additional information in reference to the description of the work for the Athenian walls,.

But if we assume the roof with rafters to be a later advance, instead of the clay roof, then must the ground form of the later stone cornice be derived from the combination of beams and pairs of rafters, as indicated by the Temple of Concordia in Akragas in Fig. 169. Then the front surface of the geison may be regarded as corresponding to the continuous face board of the ends of the rafters (with or without a terra cotta covering of the board), the mutules or viae to the under sides of the projecting rafters, inserted and ornamented small boards, and the narrow vertical band, to the continuous covering strip, that protected the cut-off ends of the beams.

Terra cotta coverings and their fastenings on roof cornices are proved by finds and by the evidence of the building contract for the city walls of Athens. [1]

Note 1. See Die Fude von Olympia. Edition in one volume etc.

p. 36-38, Pls. 38-40. Berlin. 1882. Also Programm zum Winckelmannsfeste d. Arch. Gesell. z. Berlin. 1881. The decision of Fenger (Dorische Polychromie etc., p. 19. Berlin. 1886) in reference to covered woodwork has meanwhile been corrected to accord with the facts. His rather perplexing text appears to substantially repeat the views of German masters, gratitude to them being expressed in a preface. On account of the copper nails in Metapontum, the law (in 41 st Programm z. Winckelmannsfeste d. Arch. Gesell8 z. Berlin, p. 11. Berlin. 1881) that the terra cotta boxes are to be regarded as facing pieces for the geison, is no longer tenable.

In the ruins of the Treasury of the Geloans were found fragments of the geison of shell conglomerate, which had a groove set back on the top and iron pins in the front surface. The block examined at the locality be me (1890) still retained p projecting iron pins at distances of 7.1 and 15.7 ins., slightly projecting from the surface and occupying the middle of the front side. The inclined under surface of the stone was covered by thin red stucco. In the 41 st Programm zum Winckelmannsfeste iron pins are mentioned, but on the front and upper surfaces of the stone.

In the ashlars for receiving the rafters of Temple C in Selinus were found after the discoveries in Olympia. According to my sketches made in March, 1884, these ashlars have a length of 3.94 to 6.09 ft. and more, a width averaging 2.89 ft., and a thickness of 1.57 ft. and more, according to whether t the upper surface is dressed off more or less roughly. A border on this is cut better for 10.2 to 18.9 ins. from the front face, and the front surface is more carefully dressed. The border is sunk 0.20 to 0.79 inch. Bronze and iron pins remain in this at distances of 7.28 to 7.88 ins. from the front edge. Not all of the existing blocks have at this time these pins. (Five belonging to the north side and one block of the south side have fallen into the cell). Many are free of them and b bear no mark of anything of the kind. Angle blocks were not preserved; even the pediment geison has disappeared. Some of the pins are at the junction of the border and the rough upper surface; the distances between the pins and pin holes do not correspond to the gains for the rafters, and they are also

not repeated at regular distances (Fig. 170).

These arrangements on the cornice stones are rightly referred to facings of another material, and such facings of painted terra cotta were first found in Olympia and made credible by Dörpfeld and his associates. The box shaped facings found by them and their fastenings must have accurately fitted the iron pins in the stone in regard to dimensions and distances.

None of the terra cottas found at Temple C in Selinus and exhibited in 1884 in the Museum at Palermo shows nail holes in the unpainted side; they are much rather found on the front surface decorated by a band. Likewise none have been so completely preserved, that their ends can be difinitely given. Yet it is not impossible that other pieces existed or yet exist at other places with different peculiarities.

After the descriptions and discussions, one can no longer doubt the use of terra cotta on stone. [1]

Note 1. On the other hand, see Hauser's Conference in the 41 st Programm z. Winckelmannsfeste der Arch Ges. zu Berlin. Berlin. 1881.

Scarcely any different impression exists concerning the use and arrangement of painted terra cotta cymatiums with the notable heights of 1.64 ft. and more. They were employed at Selinus, Syracuse, Gela, Metapontum, Olympia, etc., and they extend along the pediment cornice as a crowning member and along the sides of the temple as a great gutter for water, as already shown by Hittorf. These must in time have given way to t those of hard, fine-grained limestone, as shown by examples from Selinus, Himera, and Akragas, whose heights are then increased to from 2.46 to 2.63 or even 2.69 ft.

In regard to profile, ornamentation and color, these limestone cymatiums are faithful copies of the older terra cotta cymatiums; they also exhibit to us the mode of connection with the roof tiles and the careful end jointing of the pieces by overlapping grooves, the addition of small metal cramps and the introduction of grout mortar, as well as the covering of the side joints by hollow tiles, which extend nearly to the rear side of the cymatium. The gutters, i.e., the width of the channel for water, remain relatively narrow, for they measure only 6.3 to 7.1 ins. in Himera and Akragas. the water

was led from the collecting gutters through the so-called spouts, which were shaped like projecting rectangular channels, as widely opened lions' jaws, or like trumpet mouths. On Hellenistic structures the cymas are recessed moderately in height, adorned on the front by small ornaments and lion's heads. The water channel is cut in the stone cyma, mostly of shallow depth. The lions' heads are perforated for discharging the rain water.(Fig. 171). These were evidently only required on the eaves. Tubular mouth-pieces for spouts have already long since been found on marble cymatiums in Athens, and similar ones of terra cotta in Olympia and also by Cavallari in Selinus. The piece exhibits complete harmony with those found in Olympia, is preserved in the Museum in Palermo, and was published by Cavallari in 1882. (Scave di Selinunte, eseguiti nell'anno 1882). A piece of a box in the Museum at Castelvetrano exhibits the addition of such a mouth-piece to the front of a painted terra cotta water gutter.

The water from two vertical rows of tiles (together 3.7 ft. wide) on the Temple in Himera was led to one spout, whose opening at the smallest section is 2.75 ins. high and 4.72 ins. wide. On the small Treasury of the Geloans, two spouts were assigned to a row of tiles 1.9 ft. wide, and whose circular sections are 1.57 ins. diameter. A cymatium, found in Akragas exhibits an outlet opening 2.36 ins. high with a width of not even 0.79 in.; the tubes from Selinus have a diameter of 1.38 ins., and those on the Athenian cymatium are only 0.98 in., thus all have rather small sections. The number of spouts must increase the disadvantages by their small sections, and the cymatiums are 1.64 to 2.46 ft. high and prevent the water from running over.

The pieces of the cymatium also frequently had exactly the width of the gutter tiles, and their sides were bent up like those, which were covered as far as possible by cover tiles, an arrangement that probably proved better, like all the ingenious detailed descriptions of the rebates on the high cymatiums, and which were also retained in even the latest period (compare Pompeii), and evin then received improvements. A spout was there for each row of tiles, so that the cymatium could be lower and the outlets remain small. The remains of

cymatiums in Metapont belong to this class.

As before stated, the buildings of Pericles in Athens did not have gutters for water.(Cymatiums). The water fell freely from the lowest range of tiles, or in windy weather ran down over the face of the geison to its drip and then fell to the ground. Instead of the decorated cymatium along the long sides, we find the ornaments of the antefixas in use, sometimes ranging with the cover tiles, sometimes only placed as d decorations.(compare Parthenon). This was at all events the older arrangement, the termination of the lowest cover tile by a flat surface or an ornament placed before it is readily suggested, has a technical basis, and affords an effective ornamentation of the upper horizontal line without further trouble. But the combined or united antafixa ornaments must be just as ancient, which is solid with the lower flat tiles of the roof and conceal behind themselves the cover tiles of the lowest range. (Fig. 172).

The interlaced and painted terra cotta anthemions, nominally found in greater number at Temple C in Selinus, stand on flat tiles with a front facing and curved edges at the sides, i.e., are one with them. Corresponding to the other flat tiles of the roof, they were 2.46 ft. wide and were indeed nailed on the rafters like gutter tiles.(Compare Lex Puteolana. Corp. Lat. Inscr. No. 577, which requires the nailing of the lowest range of tiles).[1] While the anthemions are mostly well preserved, the flat tile portion belonging to them only remain in short pieces about 0.70 ft. long. Their original form therefore cannot be entirely determined. The water from the roof surface escaped through places left open in the interlacings. The painting of the front facing of the anthemion gutter tiles clearly indicates their projection beyond the cornice members beneath, as this was everywhere usual with the ordinary gutter tiles. Nothing surprising can be found in t the flowing of the water between the anthemions, since the same likewise occurred on the Athenian buildings, -- certainly with larger openings.

Note 1. In parenthesis above.

Selinus does not remain as the sole example of this. A fragment in the Museum at Metapont still more strikingly exhibits

the projection of the gutter tile decorated by anthemions. The round on the under side is painted in a single color and acts as a water drip; the under side is painted for a width of 3.94 ins. and shows a broken place beyond this, and it is therefore not improbable, that a vertical flange there extended downwards, as exhibited by another fragment of a painted tile preserved at Metapont, on which the projection for the anthemion exists, whose stem or base is ornamtented by a decorative projecting lion's head. It may then be permissible to regard the piece in question as the gutter cornice tile of a projection with rafters, where the bases decorated in relief covered the front ends of the rafters, or the strip fastened before them.

The ancient constructions of the roof, which are imitated on an Etruscan urn for ashes (Museum in Florence) and on Grecian reliefs (Museum in Naples), partly exhibit overhanging pairs of rafters. A painted fragment of a tile in the Museum at Syracuse also by its form admits of the conclusion of a similar purpose; only the anthemion is not set back there, but is in the same plane with the facing flange. Projections affording protection also appear on the known gutter tiles of Olympia with the undercutting like a water drip, and the gutter tile of Aegion published by Hittorf[1](Pl. 83). Other fine examples also lie on the Acropolis and in the Theatre of Dionysos at Athens, a representation of which is given in Fig.173. An example of a gutter tile with "kalypt" and antefixa wrought on it is found in Fig. 173, of the kind frequently found in Olympia, executed in larger and smaller dimensions. The older terra cotta cymatium pieces (Treasury of the Geloans, Syracuse) mostly exhibit the form of the Egyptian cavetto cornice, while another (indeed later) group has flat surfaces with a cymatium moulding at top. [1] Pieces have also been recently found by the excavations in Pompeii, which are similar to those described. [2]

Note 1. Hittorf. Plate 83.

Note 1. Puchstein. p. 52, 53.

Note 2. Duhn & Jacobi. Der Griechische Tempel in Pompeii. Plates 6, 7. Heidelberg. 1890.

The terra cotta finds at Temple C in Selinus have given oc-

opportunity for the restoration of the corresponding principal cornice, which has on the part of the Germans been published by Dörpfeld,[3] and on the part of the Italians by Cavallari.[4] We reproduce in Figs. 174 and 175 the efforts of both, with the remark, that according to Cavallari, the cornice of the temple would have appeared somewhat high, except that the beautiful crowning anthemion of the gutter tiles, when seen from below, would disappear or its effect would be lost with the observer at a considerable distance. No evidence exists for the addition of the selected cymatium with the trumpet-shaped spouts, and holes through the ashlars supporting the rafters are not found. Moreover, no artisan would permit such eccentricities in the removal of the water. Excepting the doubtful upper ending of the gutter tiles and their fastening to the stone, Dörpfeld' attempt should be accepted as correct.[5]

Note 3. In 41 st Programme z. Winckelmannsfeste. d. Arch. Gesell. z. Berlin. Pl. 2. Berlin. 1881.

Note 4. In Notizie degli Scavi. 1882. Pl. 19.

Note 5. In regard to colored terra cottas see:--

Durm, J. Konstruktive und polychrome Details der griechischen Baukunst. Taf. 10. Berlin. 1880.

Hittorf, J. J. L'architecture polychrome chez les Grecs. Taf. 6, 7, 10, 13. Paris. 1846.

Le Bas. Voyage archaeologique en Grece et en Asie mineure. Taf. II, 1, II, 2. Paris. 1848.

Semper, G. Der Stil in den technischen und tektonischen Künsten usw. Frankfurt-a-M. und München. 1860-63.

Rayet, O and M. Collignon. Histoire de la ceramique grecque. Pl. 15, 16. Paris. 1888.

Die Baudenkmäler von Olympia bearb. von F. Adler u.a.Text volume. For the horizontal terra cotta cornice of the pediment end of the Treasury of the Gelcans (Pl. X, 41) no attention is paid to the removal of water, and as drawn, this is impossible. R. Borrmann repeats the same arrangement in his "Keramix in der Baukunst." p. 36.

With this terra cotta covering of the cornice and the formation of the margin of the gutter connected therewith, the m mode of covering the roof is closely connected.

The primitive covering of the roof was that of clay mixed

with straw, which was succeeded by that with burned tiles, e everywhere on the earlier temples; their form and the mode of covering was the same now common in southern countries; great flat tiles (imbrices) with upturned sides were laid beside e each other, and the joint was covered rain-tight by concave tiles(calypteres).

To the roof of clay tiles succeeded that of marble tiles; the parts and forms of the first being transferred to the latter. [1]

Note 1. See 41 st Programm z. Winckelmannsfeste d. Arch. Ges. z. Berlin. p. 16-22. Berlin. 1881.

As the oldest kind of clay tiles and their use may be regarded the flat curved bottom tiles with semicircular cowering tiles, that were laid just as mediaeval or now on the ordinary Italian roofs of concave tiles. Then along the gutter were employed flat tiles with water drips, that were more firmly held by nailing to the rafters. [2]

Note 2. See Lex Puteolana.

The dimensions of tiles varied between 1.31 and 1.64 ft. in width and in length from 2.62 to 3.60 ft. Their surfaces were frequently coated with a fine skin of finely pulverized clay and were left in the natural color tone of light yellowish-gray or reddish, or they were coated with a dark (blackish) glaze, as shown by examples from Olympia, Argos and Mycenae. For Epidauros is proved the tarring of the tiles. [3]

Note 3. See Baunack, J. Aus Epidauros. p. 88. Leipzig. 1890. (Inscription Z. 239. "60 drachmas and 5 1-2 obcluses. (1 drachma ¼ 4.36 grains of silver).

A flat curved tile of yellowish clay 1.67 ft. wide, 3.28 ft. long and 1.58 ins. thick, found at the Ceramicos in Athens, has two impressed stamps, the uppermost bearing the words "Solchos architekton." The light clay tone occurs in both the Grecian mother country as well as in the colonies on the finished articles.

Curved tiles were followed by flat tiles with upturned edges, whose jointings exhibit the most diverse forms. But with the occurrence of the flat tiles, the covering tiles also changed their form; they were more frequently burned in o one piece with the former.(Fig. 173, fragments from Athens a

and Olympia). The gabled form of the covering tiles had to give place to the semi-cylindrical, when the top was flat or curved, as shown by the different examples. A fragment of t the former is covered with slightly shining red clay, as shown by Samian vessels, while others exhibit a tone more like terra Siena and painted or relief decorations executed in color.

Broken tiles were considered worth mending, as shown by pieces held together by lead cramps in Athens. The so-called r riveted tiles were made known by Koldewey [1] for Assos, Olympia and Khorsabad.

Note 1. Die antike Baureste der Insel Lesbos. p. 46. Berlin. 1890.

Variations in manufacture are shown by some fragments of A Athenian marble tiles, whose surfaces for water are smoothly polished, their edges, joints and raised edges, together with the under surface being rough, where the edge margins bear setting marks in the form of letters, that are also similarly repeated on marble tiles in Epidauros.(Fig. 176). An Athenian marble tile manufactory is shown by a narrow band, on it being scratched a line, on this being two pin holes not extending entirely through.

In Ephesus were found at the Artemesion fragments of antique roof tiles (now preserved in the British Museum in London), one of which came from the temple burned earlier (358 B.C.), the other from the rebuilding commenced by Deinocrates, and which are furnished on the underside with the so-called hooks. On the fragment from the later temple, these nose-shaped hooks (3.54 ins wide, 2.95 ins. long and 0.98 in. high) are placed on the left upper corner, close to the edge and 0.59 in. distant from the upper margin. Since a second fragment of the right upper corner of another tile, now in London, has a hook at exactly the same place, the entire tile must have had two hooks at its top.[2]

Note 2. See Puchstein in Woch. f. klass. Phil. 1890. page 1409-1410. What is there further sadi concerning this object is not technically entirely clear. Borrmann remarks on it, that the Ephesian fragments prove "marble tiles with hooks, since these could only have been intended to rest on horizon-

horizontal stripe."

For the purpose of ventilating and lighting, special pieces were made for both tile and marble roofs, of which examples of the most diverse kinds are preserved in Pompeii.(J. Durm. Baukunst der Etrusker und Römer. 2 nd edition. p.333. Stuttgart. 1905).

The ridge was either covered by great hollow tiles, into the sides of which were inserted the covering tiles, or a sort of mouth-piece was allowed to project, into which entered the ends of the covering tiles, or hollow and flat tiles were curved to the form of the roof and fastened on the ridge, so that the latter was protected in an excellent way. The c continuous hollow tiles were lapped; the joints were often particularly accented by rounds (Olympia, Selinus), on their crest being arranged palm-leaves parallel to the eave.(Fig. 176).

A rich collection of Grecian roof tiles, as well as those employed on valleys and hips, according to the fragments, is to be found in the great German work on Olympia, Vol. 2 of P Plates, in plates 96-100, as well as attempts at restoration of hip and valley tiles.

More difficult indeed was the case of the covering of circular buildings.

Fragments of white marble tiles, that indeed belonged to t the Tholos, I found in April, 1906, among the fragments in t the Museum at Delphi.

Accordingly the covering tiles extended radially from the vertex to the eave, when those in its vicinity (vertex) were cut from a single block, on account of the difficulty of jointing.(Fig. 177, not before published). The covering tiles were wrought on the flat tiles, thus being in one piece with them, as made probable for the marble tiles in Phigaleia by von Stackelberg. I have not seen the originals of the latter myself, but have measured and sketched the pieces in Delphi.

Pieces of similar form in clay were likewise found in Athens and Olympia.

A special decoration was given to the angles and apex of t the pediment by the so-called acroterias.(Fig. 178).

A structural reason for them did not exist; arrangements f

for them are wanting on the Theseion, on the so-called Temple of Concordia in Akragas, and on the temples in Egesta and Paestum, while the pediment cornice slabs are yet in place undisturbed; had these angle stones been laid there as loads necessary for abutments for opposing the thrust of the obliquely rising cornice slabs, by removal of the former, the latter must have slid off, which was not the case, and that was impossible from the construction of the starting stone of the p pediment, the form and position of the intermediate blocks.

On the Parthenon, the base stone lies in the angle of the hollowed-out marble gutter and loading this, but rather tending to overload and tilt over the projecting parts, than to fix them. The same was the case with the vertex acroteria, since the base stone was there placed in the cyma, on the freely projecting and not on the supported part of the cornice slabs. (With this view, see the drawing of the acroterias of the Temple of Aphaia on Egina and Fig. 178).

On roofs without water gutters along the sides, the concave tiles must extend to the front edge of the eave tiles, and the latter then received before them disk-shapted decorated plates to conceal or close the opening. These antefixas or vertical anthemions, repeated at short distances, adorned the eaves of the longer sides in the most beautiful manner. Later, as on the Parthenon (Fig. 179), they were placed independent of the covering tiles and without connection with them, serving for no special purpose, but they were indeed of an ornamental nature. On roofs with collecting gutters, antefixas frequently occurred on the cyma, that for structural reasons, which originated from the lengthening of the cover tiles to conceal the joint of the two adjacent pieces of the cyma. [1]

Note 1. See interesting examples of terra cotta antefixas in Campana, G. P. Antiche Opere in Plastica. Rome. 1842; likewise decorated covering plates (antepagmentas) and antefixas with entire little figures on the Temple in Alatri.(Bassel. Neu aufgefundener Temple in Alatri. Cent. d. Bauv. 1886. p. 197, 207); Borrmann & Neuwirth: Durm, Baukunst der Etrusker und der Römer.

The Attic monuments of the period of Pericles had marble tiles throughout, of which Pausanias makes particular mention;

he says of the Temple of Zeus in Olympia, that the roof was not covered by burned tiles, but with Pentelican marble cut in the form of tiles, a procedure that Byzes of Naxos must have first introduced. [2]

Note 2. The industry of cutting roof tiles from marble must have been native on Naxos at certain times, according to later researches. Of coarse-grained white island marble, such as the ancient quarries on the north end of the island of Naxos supplied, were the remains of tiles of the Temple of Zeus found in Olympia (thus contrary to the statement of Pausanias, Book V, Chapter 10, 3), as well as the remains of tiles of antepersian buildings on the acropolis of Athens. The roof tiles of the Parthenon and of other postpersian structures on the acropolis and in the city of Athens were of the lower white Pentelecan marble, the upper surface indeed appearing to be sawn and the lower chiseled.(See Lepsius, G. R. Griechische Marmorstudien. From Appendix to Abhand. d. Kön. Preuss. Akad. d. Wiss. Berlin. 1890.

Division V. City walls, retaining and terrace walls with and without buttresses, stonecutters' marks, setting marks, and city plans.

As stated under Division II, the oldest stone structures were not constructed according to a harmonius and uniform system, sufficient evidence of which is given by the walls of Thera, Troja, Knossos, Tyrins and Mycenae. The mode of their execution was devoted to utilizing existing materials afford- by the immediate vicinity. Thus for example, massive ashlars in the walls of Tyrins and Mycenae, airdried bricks with inserted beams in Troja, also airdried clay bricks in Assyrian and Persian cities (Khorsabad, Susa) -- kinds of natural stone breaking into large and small blocks, together with artificially produced moulded bricks.

Of the enclosing walls belonging to the historic period, most do not precede the 5 th century B.C. They surround the higher and lower city or the temple precincts in interrupted long lines, frequently guarded by towers at definite distances. Towers also protected the entrances to the interior of the city, which were arranged for occupancy internally and were furnished with slot openings for archers.

Thus for example, according to the drawings of Clerget in Magnesia-a-M [1], the original city walls were constructed of hard limestone ashlars full of holes and with bosses projecting 1.97 to 2.36 ins., with alternating headers and stretchers in the same course and 7.55 ft. thick. The principal gateway was flanked by two towers 28.22 ft. wide, whose front walls were 14.27 ft. thick. Besides these were also sally ports and breaks projecting 6.56 to 16.40 ft., as shown by Fig. 180. Concerning the elevation of the wall and the form of the defensive passage, information is lacking.

Note 1. See Magnesia-am Meander. p. 19. Berlin. 1904. Report on the results of excavations in the year 1891-1892 by C. Humann.

According to Vitruvius (Book 1, Chapter 5), the distances between the towers was to be chosen so as to correspond to t the flight of an arrow.

In Priene [2] were arranged 10 towers in the acropolis wall and only 16 in the much longer city wall at accidental dist-

distances of 196.85 to 984.30 ft. Four of these towers were hab itable and contained 3 living rooms for a permanent guard. The walls were founded on the rock and executed with similar cut rec tangular blocks(emplecton); between two ashlar facings was a fil ling of stone spalls and clay, the visible faces of the ashlars h ing rough bosses (rusticated) and no dressed margins. Only the make an exception thereto.

Note 2. Priene. Ergebnisse der Ausgrabungen und Untersuchung en in den Jahren 1895-1898 von Th. Wiegand und H. Schrader. Ber lin. 1904. Concerning the arrangement, construction, and the s subdivision of the material, this publication is a model, and it cannot easily be excelled by any other, not merely in the German empire, but entirely in general.

Philo requires, that the masonry of the towers should not be bonded with the adjacent masonry of the walls.

The city walls in Paestum [1] are built of travertine ashlars an still enclosé the ancient city area with a perimeter of about 3. miles. The square eastern tower is still excellently preserved a height of about 13 courses of the finest jointing. In the joi ing of the masonrya regular bond is not observed, for in height two equal courses of stones with square faces alternate with sma courses one half as high, and the end joints frequently extend v tically through several courses. "With especial skill the enclos ing wall of Ephesus [2] was laid out, which frequently remains in 15 courses, has square projecting towers at distances of 32.8 ft and it requires a special publication, for which the drawings ar already commenced." The enclosing walls form one of the greatest systems of fortifications left to us by anticuity. At the part on the Coressos is found a tower with an internal court.

Note 1. Founded in the 6 th century.

Note 2. Forschungen in Ephesos, I, published by Oest. Arch. Inst. p. 222. Vienna. 1906. For the plan, the map of Captain A. Schindler is particularly notable.

Of the Hellenistic period, the walls, gates and towers at Per- ge are to be particularly mentioned, since in addition to the plans the upper part of the structure is almost entirély preserv ed and remain assured in form and arrangement with the wall slot windows, low gable roofs, and these pertain to the earlier forti

fortifications of Perge.(Fig. 181).

The towers are 19.69 to 22.97 ft. wide and 26.25 ft. deep with a height of 42.65 to 45.93 ft, their walls having a thickness of 4.13 ft. and ashlar courses 1.97 ft. high.

The three walls exposed to attack have arrow slots. In a higher degree than these towers, the southern gate, now within the enclosing walls, bears the Hellenistic stamp -- a double gateway flanked by two round towers and transformed into a state gateway. (Fig. 182).

The crescent-shaped enclosing walls of the court of the older principal gate are subdivided by niches; the piers of the triple arched gateway remain to the height of 3.28 ft. and were decorated by pilasters and columns. Their entablature blocks, voussoirs with archivolts and coffers yet exist. The round towers have a height of 35.56 ft. and walls 7.22 ft. thick. An interesting measured drawing and a safe restoration of the Hellenistic exterior of the tower based thereon is given by G.Niemann and Petersen on page 61 of the beautiful work; "Städte Pamphyliens und Pisidiens" by Niemann and Petersen, edited by Count Lanckaronski. Vol. 1. V Vienna. 1890.

We shall not forget, even if they also afford nothing architectural, what the Hellenistic fortifications do give; the walls of Syracuse and of the fortress of Epipolae, and still less the massive fortifications on the northern front of the acropolis of Selinus, that Hermocrates erected after the destruction of the city by the Carthaginians and after 409 B.C., with the semicircular b bastions and the projecting semicircular towers, as well as the peculiar covered sally-ports into the ditch.(Fig. 183).

Defensive galleries and battlements, behind which men could protect themselves from the shots of the enemy, and between which the enemy might be annoyed, or even simple covering courses terminate the ascending walls. Of the walls at Messene are still given battlements of the simplest kind; in Pompeii they still appear furnished with cross projections to protect the back.(Figs. 184, 185). The masonry consists of a nucleus of quarried stone masonry and clay, which was faced with ashlar walls with courses of s stretchers and headers, 6.56 ft. or more in total thickness.

Otherwise the enclosing walls (definsive walls) of cities and temple precincts were mostly carefully built of great polygonal

or horizontally coursed ashlars without special decoration, or in time of need and distress were constructed without regard to similar material and jointing. "Walls composed of all sorts of stone here and there even uncut and just as they were brought; also many columns from tombs were built in, and even stones wrought by the sculptor"-- thus Thucydides describes the walls of Athens as rapidly rebuilt after the Persian wars --, while the walls of Piraeus were most carefully constructed. [1] No binding material, neither lime nor mortar, was employed for them; the great and accurately cut stones were laid on each other and connected together by iron cramps set in cast lead. To have the necessary stability the roughly coursed masonry must be built quite thick, while for that definitely coursed and made of squared or polygonal blocks, the stability depended upon accurate fitting of beds and end joints with a carefully bonded coursing of ashlars of medium size. (Fig. 188). The horizontal coursing of ashlars set dry, whose end joints were not always vertical, but were largely cut obliquely, is found on Egyptian ashlar masonry, that can be dated back to 1600 B.C.; it is there characteristic that some stones project into other courses, a procedure transferred to Grecian masonry of the earlier period.(Fig. 189). The different ashlars in Egyptian buildings were frequently connected together by double dovetail cramps of wood, also by mortar of lime and sand, while the Greeks employed for this purpose in addition to wooden cramps those of iron set in cast lead, or more rarely those of bronze. Whether the method of the indirect connection of ashlars may or may not have been brought by Grecian colonists from Egypt to Greece; the principle remains the same as here; excepting the connecting material is wood in the one case and metal in the other.

Note 1. There may still be seen today in the city walls of Athens these portions of the wall built in haste, mixed with drums of columns, triglyphs and cornice blocks. A portion of the wall of Themistocles in Athens near the Dipylon is given in Fig. 186, according to Professor Noack being an archaic grave stele, the sculptured side turned inside, discovered in the spring of 1906, whereby the description of Thucydides is shown to be correct. Of technical interest is further in the vicinity the partly destroyed vaulting over the brook Eridanos by corbelled ashlars in courses. (Fig. 187).

The ancient walls of Assos in Asia Minor (Fig. 190), which surrounded the ancient Doric temple, are constructed of low courses of ashlars, carefully wrought on the faces and in the joints; headers and stretchers alternate in a course, so that the headers extend entirely through the wall, but the stretchers do not reach the middle of the wall and leave voids; over the entrance doorways where the recessed lintel is to be relieved, headers are found in every third course. In other portions of the wall, which have the considerable thickness of 9.85 ft., ashlar facings are arranged on both sides with infrequent headers, but with solodly constructed bonds at angles, so that the middle third of the wall is composed of unwrought material, a mode of construction seldom found elsewhere that in Grecian masonry. This regular coursing, together with the smaller dimensions of the stones, appertains to the later period in Egypt, and it always indicates an early one in Greece.

The opening of a gateway in regular masonry is usually a vertical rectangle or trapezoid, and it is also covered by a large horizontal stone lintel, while the recess for the gate is semi-octagonal, semicircular or pointed-arched at top, although this arched form is produced by corbelling out.(See forms of gateways in Assos and in Acarnania; Fig. 191). The arched form composed of two stones cut in curved shape is found in Acarnanian walls (Fig. 192) beside such with voussoirs. [1] In polygonal masonry the arched spanning of openings almost results of itself. Likewise triangular covering of the same and formed by corbelling, or a stepped horizontal covering, or a complete equilateral triangular shape of the opening for light are found. In Selinus the passages into the ditch of the external works of the acropolis are formed by projection of the stone courses with a horizontal ashlar. Allied shapes are also at the Royal Tomb near Knossos on C Crete and in purely triangular form at the Fountain House at Termessos. [2] A combination of polygonal masonry with semicircular arches of voussoirs is shown by a so-called Cyclopean wall in Cnidos.(Fig. 193).

Note 1. See semicircular gateway arches formed by projecting courses, beside such with voussoirs in Perrot & Chipiez. Vol. 1. Egypt. p. 112-114.

Note 2. See Fig. 193, from the publication:- "Aus dem klassischen Süden." Pl. 121. Lubeck. 1896. Also Fig. 195, from "Stadte

Pamphyliens und Pisidiens by Lanckaronski. Vol. 2. Pisidien. p. 59. Vienna. 1892.

But pointed and round-arched forms of gates occur on the battlemented city walls of Nineveh;[3] arches and vaults were already found in Egypt in the time of Usurtesen I (2200) B.C.). A small vaulted tomb existed in Thebes, in the Valley of the Queens, whose arch bore an inscription in whilh Amenophis I occurred; another tomb exhibited the name of Thothmes III (1597 B.C.). The entrance to one of the Ethiopean pyramids is vaulted in the form of a depressed arch; the stones are cut as voussoirs and the joints are filled with fine cement and stone chips. Hoskins regards these pyramids as more ancient than those in Egyptian Thebes; hence the arch dates back in Egypt to before 3000 B.C. The Chinese assert that they have possessed it from time immemorial.

Note 3. See Layard. Nineveh and its Remains. Vol. 2. London. 1849.

The invention of the arch cannot be ascribed to any particular people with certainty; it may have been made by different nations at the same time in different localities; in countries possessing but little wood, or where large blocks of stone were quarried, and men were required to construct a firm protecting ceiling with small pieces of stone, the inventive genius of mankind must then have led to similar results, for necessity is indeed everywhere the mother of invention!

The Etruscans were the first European race to introduce a frequent use of the arch in its buildings, while it was scarcely used by the Greeks, or at least was not accepted as a motive in their architecture, although known to the Egyptian and Phoenician colonists, who immigrated into Greece, although the Greeks may have seen it among neighboring peoples and have learned it from them.

Defensive walls constructed in accordance with Egyptian rules (horizontal courses of trapezoidal ashlars), or after Phoenician rules (polygonal ashlars like those of Tiryns and Argos), are quite extensively found in Greece and are contemporary. Notable in many cases is the double rebate form of the angle of two portions of the wall intersecting at right angles.(Fig. 194).

Considerable remains of these walls are found in Greece in addition to those already mentioned:--

On Ithaca, -- in the style of Tiryns.
On Cephalonia, -- in polygonal coursing.
In Euphagion, -- courses more nearly horizontal, with projections of the ashlars into other courses.
In Paos, -- the same.
In Elateria, -- polygonal and rather nobler than at Tiryns.
In Cortynia, -- arranged more nearly horizontal.
In Psophis, -- almost entirely horizontal.
In Oiniadai, -- horizontal courses with oblique end joints.
In Aiolis, -- polygonal.
In Coronea, -- the same.
In Abai, -- the same.
In Lycosura, -- the same.
In Daphne, -- the same.
In Platai, -- the same.
In Oinone, -- the same.
In Eleutherai, -- horizontal with inclined end joints.
In Pharsala, -- the same.
In Messene, -- the same.
In Methana (Argolis), -- the same.
In Kleitor (Arcadia), -- the same.
On Samos, -- the same, etc.

When the walls enclosed large temple precincts, as in Olympia, Athens, Eleusis, etc., gateways without decoration were no longer employed, but magnificent portals -- propyleions-- with porticos and roofs decorated by pediments formed the entrance and indicated the facade of the temple, from the simple arrangement at Sunion to that most richly developed at Athens.(Figs. 196, 197).

Remains of retaining walls have been preserved for us at Delphi [1] and in the temple terrace of the Olympeion at Athens, originally commenced as a Doric building by the Pisastratides. Buttresses at regular distances interrupt the walls, which are battering on their inner sides, giving them great stability with a moderate use of material. The coursing is uniformly horizontal at Athens, with a tolerably uniform height of the stones (1.64 to 2.23 ft.). Headers and stretchers alternate in the individual courses, although not regularly; 3 stones together make up a length of 18.70 ft.(equal to the distance between the buttresses), with a maximum of 19.89 ft. (Fig. 198). The stones are

set without mortar; the headers extending into the wall up to 4.92 ft., and the breadth and height of the stretchers are usually equal. Their faces are in part brought to a perfectly true surface and are partly finished with marginal drafts and bosses. The inclined buttresses project from the wall as much as 3.28 ft.; individual stones of these bond into the masonry; others merely abut against it.

Note 1. See the statements and the representations of walls with "wavy" beds in Division 2 of this volume.

Walls strengthened by buttresses are also found on the Stoa of Hadrian at Athens, then on the Palestra or Gymnasium (?) at Perge, and further on the late Hellenistic terraced structures of the lower Gymnasium at Priene, executed in a grand manner at the lower end of the theatre terrac at pergamon. The buttresses here project as extensions of the transverse walls, 5.58 ft. at their bases and taper into the wall surface at top.(Fig. 199, from the great German work on Pergamon. Vol. 4. Pl. 46). The inclined edges have marginal drafts.

In the principal cemetery of the Athenians in the vicintty of the Dipylon (now a cemetery near Agia Triada), there still are magnificently constructed continuous retaining walls composed of extraordinarily fine and beautifully wrought ashlars, polygonal, trapezoidal, and those with reentrant angles. The jointing of these is finely executed in a masterly and dinished manner; the faces of the stones are very slightly convex at their centres and are not perfectly smooth, this being caused by the crisp and shelly fracture of the stone. The stones differ greatly in size, running from triangular spalls measuring but a few square inches up to blocks having 10.76 sq. ft. of face. (Fig. 200).

The beds are horizontal throughout, though the courses interlock into each other. Headers and strethcers alternate quite irregularly in them, the former bonding into the wall up to 4.92 ft., the latter only 0.82 to 0.98 ft. The stones are in contact for but an inch or so in the joints, this being sometimes reduced to a mere edge, in a manner not to be recommended. The interstices between the stones at the back, like the external masonry, are filled dry with little fragments, large uncut blocks then abutting against them to make up the required thickness of wall.

At the same place, we likewise find a stepped wall of Poros a ashlars, whose bosses project an average of 1.57 ins., and which have very finely pointed drafted margins 2.36 ins. wide. In accordance with the arrangement of the bosses, these drafted margins extend around only three sides of an ashlar.(Fig. 201).

On a prepared horizontal footing course, we find finely executed polygonal masonry of breccia in the southern fortress wall of the acropolis at Athens, and in the vicinity of this portion are also others, where the smallness of the pieces of blue limestone and of reddish breccia employed is striking. The smallest chips are again used, and economy of the material is carried to the extreme point. The stones bond 7.86 to 23.6 ins., and the beds are dressed smooth in the finest manner for a depth of 3.93 to 4.72 ins.

Such bits of walls are frequently only built to fill gaps in the naturally solid location of an area, as shown by examples on Samothrace;[1]; they are then not regularly finished on top, but that is frequently left jagged. [2]

Note 1. See Gonze, Hauser & Neumann. Archaeologische Untersuchungen auf Samothrace. Vol. 1. p. 29. Vienna. 1875.

Note 2. Similar examples are found in the so-called pagan walls in southern Germany.

One peculiarity also appears in the walls of the Stoa of Hadrian at Athens, subdivided by buttresses, where the ashlars with drafted margins and bosses are set on edge and are unpleasing, as well as the sunken triangular bed joints.(Fig. 201).

In the retaining walls of the Altis at Olympia next the slopes of the hill, the porous yellow limestone blocks have an average size of 1.15 to 4.26 ft., were connected by double dovetail wooden dowells (?), and their ends were joined by wooden pins. (Dowells and cramps have disappeared). The wall is subdivided by buttresses 207 ft. wide and projecting 4.27 ft., which are placed at distances of 19.70 ft.

An interesting combination of polygonal masonry and horizontal courses is shown by the retaining walls of the Theatre in Balbura (Lycian highlands), also furnished with buttresses. The walls are faced with polygonal, and the buttresses with rectangular b blocks. Semper assumes the buttresses of the substructure to be merely ornamental, merely parastates, comparable to the ends of

the timbers of Swiss houses. Their structural purpose cannot be denied.

Peculiar is the treatment of the faces of the ashlars of the plinth in Epidauros (Fig. 202) with narrow scalloped bands.

The ashlars dressed on all sides, that were completely prepared by the stonecutter, frequently bear marks on the surface, that are similar to those on the stones of mediaeval structures. Their use extended over the entire ancient world.[1] In Persepolis, Egypt, Jerusalem, on Crete, in Damascus, Baalbec, Sidon, on the Eryx, in Pergamon, on the Treasury of Sicyon in Olympia, on Samothrace, in Sicily, lower Italy and other places, it everywhere appears.

Note 1. See Richter, C. Ueber Antike Steinmetzzeichen. 45 th Programm f. Winckelmannsfeste d. Arch. Ges. zu Berlin. Berlin. 1885.

On blocks like the stones of the Cyclopean walls, which were prepared on the site just before setting, the marks are not found. They possessed no meaning for the building, but merely referred to the production of the dressed blocks, -- they were indications of origin, contractor's marks, but were not individual marks of the workmen. Fig. 200 represents such marks from Eleusis and Samothrace.

Yet as the area within protecting and defensive walls was settled, as the dwelling places and temples were arranged, -- how was the building plan of the city created? The regular plan of the lay-out of the streets is not to be ascribed exclusively to the Alexandrine period. If Athens and Sparta and many other cities were not planned with T-square and triangle, there were already in the earlier time different great cities in the colonies, for example Selinus and Paestum. The former had its orientated temple and also orientated streets. Two chief arteries of traffic intersected at right angles the city in the directions of east to west and north to south, into which again opened at right angles the lesser streets. Selinus was founded in 628 B.C. and destroyed in 409 B.C. by the Carthaginians, but the plan of its streets is as old as its temple -- and prealexandrine. The same is also true of Paestum, founded about 600 B.C., where the course of the streets is determined by the locations of the gates. Its temples are to be placed in the 5 th century and its straight streets as well.

Diodorus (Book 12, 10) states concerning the city of Thurii, that the inhabitants subdivided the length of the place by 4 streets, one of which they named Heraclea, another Aphrodisias, the third Olympias, and the fourth Dionysies. They divided the breadth by three streets, which were called Heroa, Thuria and Thurina. The narrow spaces between these streets was closely beset by houses, so that the new city gained a beautiful appearance. Likewise Cyrene is said to have had two main streets crossing at right angles. Strabo (Book 12, 4) tells of the city of Nicea in Bithynia, that it was rectangular in plan, had four gates, and was intersected by streets at right angles, so that the four gates could be seen from their intersection. This widely disseminated system of city planning, that was adopted by t the architects of Alexander the Great, is referred to the master Hippodamos of Miletus (5 th century), who prepared the plans for the cities of Rhodes, Thurii and of Piraeius. The ground idea is borrowed from the east. According to the statements of Herodotus (Book 1, 180), the inner city of Babylon was full of houses of 3 and 4 stories and was intersected by streets, still extending in straight lines, not merely the main streets but even the cross streets, that led down to the river, where were placed as many gates as there were streets. Thus the same regular subdivision into building squares, as adopted by the later style of Hippodamos.

From the period of Alexander dates the city plan of Priene with its plan by Hippodamos, whose hygienic advantages were emphasized by the physician Oreibarios (writing from Selinus in the year 100 A.D.), and totally opposed to the views of Vitruvius. (Book 1, 6). According to him, streets only have the proper direction, when the winds are kept out of them by wise precautions, since if cold, they are unpleasant, if hot, they cause disease; if damp, are injurious, as shown by the street plans of Mitylene on Lesbos.

The plan of Priene may give the closing view of the plan of a late Greek city with its public and private buildings (Fig. 204), and Fig. 205 is a perspective of the same, according to the restoration by the architect A. Zippelius, employed by the Archaeological Institute at Athens, who has most kindly permitted us to reproduce his drawing.

The number of inhabitants of the Grecian cities named above varied at different times. Thus Athens numbered about 100,000 free persons and over 200,000 slaves in the time of Pericles, Syracuse had 500,000 inhabitants in the best period, from Tarentum Fabius Maximus could sell 30,000 citizens as slaves in the year 209 B.C., and Akragas, "the most beautiful city of mortals," counted in about 420 B.C. 200,000 men and 800,000 inhabitants, including slaves and those dwelling in the vicinity.

Division 6 Colored external and internal architecture of buildings.

The use of polychrome painting on the architectural structures of the ancient oriental peoples, the Asiatics and Egyptians, is well known, and evidences thereof are still preserved on the external walls of the Temple on Philae and in the interior of the Temple at Denderah. Pleasure in the color itself, which appears in a thousand forms and everywhere in the nature of the dweller in the south, may still have been the principal reason for applying this to their works. "The bright flowers of many colors and those of fruits, with which nature decks herself, appear to invite mankind to adorn themselves and all their belongings with the highest colors possible." (Goethe).

But practical purposes might likewise be served by the use of colored ornamentation; building materials of small resistance were thereby furnished with a protecting coating, and t the external surfaces of ugly materials were concealed by it.

The Greeks indeed followed Egyptian customs and Asiatic tastes, when they applied to their belongings and their monuments the colors of equal intensity as their highest ornamentation. To the impermanence and easy destruction of this decorative and protective means in the open air is to be attributed, that vestiges are chiefly preserved for us only on protected parts, frequently only on fragments buried in rubbish and earth. And yet these exist in a sufficient extent, that we may decide by their aid on the form and color with tolerable certainty.

We further have evidence based on the ancient writers. Homer and Euripides speak of colored architecture. The walls of the Palace of Alkinous were described as decorated by blue garlands, in the "Iphigenia" was mentioned the temple with beautiful columns and gilded frieze etc., and Vitruvius permits the triglyphs to be painted with sky blue wax colors.

A further proof is the unfortunately broken and incomplete slabs of Pentelican marble, found on Oct. 10, 1836, in the r right wing of the Propyleion in Athens, on which were engraved the accounts for the work of completion and decoration. We extract from them, for example:-- "To those that built the scaffolds for the painting of the lower part under the roof,

to Manis from Kollytos 4 oboli; to the painters -- to him th that painted the cymatium on the inner architrave 5 oboli per foot [1]; 166 leaves of gold were purchased for gilding the shells (are beads or heart-leaves meant ?)".

Note 1. According to Dörpfeld, the Attic foot = 0.2957 m. (or = 0.96 American foot).

Likewise in the year 1886, during the excavations on the Acropolis in Athens, were found many fragments of friezes and main cornices, which were painted in colors and had retained in the earth a remarkable freshness and animation, and which may still be enjoyed.

But the best evidence for the original painting is still p preserved for us on the Athenian monuments themselves. The Theseion, Parthenon and Propyleion exhibit sufficient vestiges;on many interesting architectural fragments of marble or limestone with a coating of stucco, which are contained in the Museum of Athens, the entire painting is still visible. Yet one must not seek colors on the large surfaces of the columns, on the external parts of the entablature and the cell walls of the marble monuments; for the surface of the marble is worn off on those parts exposed to wind and weather, therefore must a protecting color have already disappeared before the surface of the marble was attacked. That the golden tone now partially covering the monuments, and which results from a lichen, could have formerly taken the place of a coating of color, is hard to conceive. [2]

Note 2. See Durm's "Aus Attika". Zeits. f. Bauw. 1871. p. 471, and the opinions of Landener and of Faraday there mentioned; also Lepsius' "Griechische Marmorstudien," p. 18, 121. Berlin. 1890.

According to the latter, Pentelican marble is characterized by its containing iron (lime 56 per cent, carbonic acid 44.002 per cent, iron oxide 0.122 per cent, making a total of 100.124 per cent, while that from the Temple on Cape Sunion by chemical analysis scarcely contains traces of iron in the mass of the stone.

The latter has remained snow white; the marble of most monuments in Athens is white on the south side, but it has become golden to brown on the east and west sides, and grayish-white

to blackish-gray on the north side. The beautiful golden-brown patina must have resulted from the weathering of the surface of the stone, the lime of the marble being dissolved and removed by rain water, while the iron contained in the marble was transformed into brown iron (tronoxyhydrate), whose intense brown coloring is also plainly evident today, even if in very small quantity.

At the Olympeion the yellowish-brown color predominates on the south sides of the columns and architraves; the marble remains whiter on the other sides, but many dark brown lichens are scattered over it. On the Theseion and the Parthenon the north sides have remained almost white, but they bear scattered lichens, while especially the west sides are covered by t the golden brown patina.

These phenomena are not contested, and the fact that the north sides of Athenian buildings are least colored brown remains to be explained by Lepsius (page 121); "it also depends upon the weather, together with the rain and the heat of the sun." Golden colored marble fragments selected on the Acropolis, I had examined a few years since by the late Court Councillor Knopf at the Polytechnic School in Carlsruhe, when there resulted the absence of iron in the stone, so that the brown tint of the surface must be referred to the existence of a lichen.

The Sicilian monuments and the architecture of Pompeii, indeed dating from a later time, likewise exhibit vestiges or even complete painting.

It remains to lament, that investigators during the previous and at the beginning of the last centuries have left us such scanty notes in this respect, while they must have seen much more than those born later. Only in the second half of the last century did the investigations assume definite form concerning this important part of Grecian architecture, the external ornamental decoration, and the first who introduced the idea of a complete polychromy did not fail to meet with strong opposition from artists and learned men. An embittered strife with the pen lasted for long years as a result,for and against polychromatic external decoration.

In the year 1823-1824, Hittorf made corresponding statements

about Sicilian monuments, and he presented in his frequently mentioned magnificent work (L'Architecture Polychrome chez les Grecs. Paris. 1851) almost complete prrfs of polychromy. Meanwhile the gifted Semper (Der Stil. Vol. 1. Plates 1, 2, 3 6, 9. Munich. 1860-1863) engaged in the contest in this matter and contributed by word and act the essentials for the settlement of the question at issue.

Likewise the French and English investigators like Desbuisson, Paccard, Burnouf, Penrose and others were in favor of a complete polychromy.

Polychromy on Grecian architecture and sculpture is no longer a question today; to the evidence formerly described (see the first edition of this work, pages 118-120) has been added new proofs during the last decade. In the so-called Persian rubbish on the Acropolis of Athens did these appear, and they fill the Museum on the Acropolis with others in the Central Museum there.

In the most beautiful and complete manner was a portion t thereof published in the magnificent work "Antike Denkmäler" by the Imperial German Arahaeological Institute. Vol. 1. Berlin. 1886-1890. Plates 3, 18, 19, 29, 30, 38 and 39 therein represent by excellent reproductions the originals of painted heads, garments of statues, on which the fabrics are painted with borders in costly work, together with cymas, Ionic and Doric-like caps of steles with their colored palm-leaf, fret, scale and leaf ornamentation.

But the most wonderful and prominent example is preserved on the so-called Macedonian royal sarcophagi, which also determines that works of sculpture of the very highest rank could not lack coloring.(See Durm's Makedonischen Königssarkophage. 1890. Also Hamdi & Th. Reinach. La Necropole de Saida. Paris. 1891).

Otherwise the use of materials of different kinds and colors likewise had already given polychrome coloring to similar works (architectura and sculpture), and the highest attainments of Grecian sculpture were executed in this manner. The Chryselephantine (gold-ivory) statues shone in splendid golden garments, that were again ornamented by painted or enameled decorations (compare the Statue of Zeus in Olympia);the

nude parts gleamed in the dull shine of the slightly etched ivory (which would otherwise have assumed in time a dull tone, that has a similarity to the color of the skin of the southerner -- the red cheeks of the Germans are not typical there); the fire of the eye was produced by precious stones inlaid in the pupils. (Compare descriptions of the Minerva at Megara, the statues found at Ostia in 1797, the eye pupils of the Elgin fragments of the Athena on the pediment of the Parthenon, statues and busts in the Vatican, one of which even has inlaid eyelashes of silver.

Likewise the use of variegated marbles for statues, which was often successfully attempted and executed, thus being a monumental polychromy, that during the late period was compelled to yield to the at first impermanent coloring applied with the brush, shows the requirement for always seeing sculpture colored. The like procedure is also indicated in architecture.(Compare in this sense the terra cottas also).

To the critics, who compare these facts with modern conceptions op beauty and taste, I might apply Reber's words, used in another place, that "our unsettled esthetic feeling no l longer understands many things that Grecian taste approved and loved, but that the critical feeling is most deceptive in questions of the history of art."

The colors employed by the Greeks in their polychromy were few, and they are usually placed unbroken beside each other, only the so-called full cocors, blue, red, purple, green, y yellow and gold, with also brown and black on terra cotta, came into use on surfaces and decorations; rose, light green and violet on the garments of statues; they were sometimes applied in thick coats, sometimes in transparent tints or g glazes.

Besides the triglyphs, the colored ornaments of the other architectural members are so small and delicate, that at the height where they were applied, they would scarcely be effective, unless they were painted with full colors. This fact is never sufficiently appreciated by those, who in the variegated effect oppose the hardness of the tones; the latter w were softened by distance and by the proportions.

The oldest stone monuments were built of porous limestone,

and others of tufa-like trachyte, as shown by the monuments in Assos, Pergamon, and those in Sicily (Selinus and Akrakas), the Temple on Egina and the ruins of the ancient Temple on the Acropolis of Athens. The structure of the material did not admit of the production of a close and smooth surface, and it made the application of the painting directly on the stone impossible. For this purpose it must first be covered by a painting ground, that consisted of a fine white stucco and firmly adhered to the porous stone basis, so that now in spite of weather and time, specimens of it are preserved. B But with all the excellence of the coating, repairs in this stucco covering became necessary from time to time. Therefore as a result, men looked around for a better material, that would not require this preparation and was not exposed to these disadvantages, and they employed in the best period in Asia Minor and Attica the crystalline white limestone -- marble -- in place of the porous conglomerate stone, shelly or coarse-grained limestone. For this was no longer necessary a special preparation of the surface for receiving color; it might be applied directly on the smoothly polished marble, and this may indeed be one reason, why this no more costly material, but only wrought with more difficulty, was retained and was sought for.

Just as the more costly material, the gold, must again disappear under painting or enamel, just as well and even sooner might it occur, when the white marble, which only replaced stucco in a better way, was covered by color.

The application of the colors on a stucco ground.might be made directly while it was fresh or dry; the marble surfaces frequently show special preparation therefor. The parts covered by colors shining through (this could not be proved), such as columns, architraves and walls, were carefully polished smooth, as well as the delicate members of the architectural portions to be decorated. The joints in columns and walls, architraves and cornices were not accented, so to speak; they were therefore so carefully executed, that they are often scarcely perceptible to the eye, and a decoration of them by color does not occur on Doric temples.

The places which were gilded are characterized by a pecul-

particular smoothness of the surface. In many places, and this must have been the oldest procedure, the ornamental drawing was incised in the marble or the fine-grained limestone, i.e., its outlines were incised and then filled with color (fragments of this kind are in the Acropolis Museum at Athens); in other cases the ornament was lightly sketched with the steel point, the ground being scraped or roughened, so that the colors would better adhere; in yet others is the ornament sketched with the brush directly on the smooth stone without a preliminary outlining of the form. (Compare fragments of both sorts on the Acropolis at Athens). Likewise the separate ornaments were perfectly sculptured and afterwards painted. (compare capitals in the interior of the Propyleion of Athens), which were frequently succeeded by works in variegated marble. The blue and green colors, that covered the marble in a thickness of 1/25 to 1/16 inch, were prepared with wax (for example, as shown by remains of the cornices of the Propyleion and other architectural fragments in Athens), and they had no very firm adherence to the marble surface. (The blue and green, after scaling off, left almost no perceptible traces of color on the marble, while the traces of red penetrated deeply and may scarcely be removed. Compare in this respect various parts of cornices or even a figure in relief, the so-called Warrior of Marathon, and other older correspondingly sculptured or merely painted grave steles in Athens. (See Conze's "Die Attischen Grabreliefs"etc. Plate 2. Berlin. 1890).

May then the Grecian polychromy on the exterior of the temple be assumed as based on Egyptian tradition, or may it be regarded as an art means for heightening the effect of sculpture and architecture and for concealing the slight value of the materials, or may architecture, sculpture and painting be placed as equals, so that it may be said that each one of them may be enhanced by the others; yet so much is certain, that polychromy on sculptures and every kind of architecture was felt to be a necessity.

The light and nearly white tone, that covered the plain portions of the stuccoed stone temples of Sicily,and that also occurs on the cell walls of the Temple on Egina (or was

found there), permits the conclusion, that the same tone was also retained on the marble structures. "This general tint can scarcely have been a thick encaustic layer of color, as for the ornaments, but only a simple transparent coating, which made the tone of the marble uniform, but removed nothing of its natural beauty; it readily assimilated those plain parts of the architecture with the nude figures, whose flesh-colored tone was probably produced by a thin coating, in order to not injure the delicacy in the representation of the forms, while the material objects, such as clothing etc., as stated and as may be seen, were painted in encaustic.(wax).

Furthermore, it is natural, that the surfaces of the marble ashlars are never faultlessly white; they are frequently permeated by bluish or yellowish stripes, which in time become more distinct and produce a play of color on the surfaces. If the ashlars are rubbed smooth or polished, then the colors or gilding laid thereon reflect upon the surface so strongly, that the original "white" cannot longer be perceived as such by the eye.(Compare in this sense Hansen's Academy building in Athens).

If we return to what has been stated, and base upon the remains seen or proved, an image of the painted Doric temple before our eyes, then first the walls of the cell, the columns, architraves and cornices gleam in a white or light yellow tint, while according to the theory of Reber, only the parts shone in varied colors, that were derived from an original wooden style. The capitals of the columns of the best period remain plain and without color ornaments (this was indeed quite otherwise in Paestum), as well as the front surfaces of the architrave, if those did not receive a temporary decoration by captured weapons and by inscriptions, as on the Parthenon and on the Temple of Zeus at Olympia.

Colored or gilded drops hung from the narrow regulas beneath the triglyphs, the regulas being themselves adorned by palm leaves directed downwards or left plain. The crowning cap band is covered by a delicate fret of green and red colors; the triglyphs here have a strong sky-blue, neither blackish nor grayish blue, strongly gleaming tone. The figures of the intervening metopes have the natural colors of

the flesh and the garments; the ground from which they rise was harmonized with the blue of the triglyphs, light red or light blue in color (Selinus or Olympia), or it was left white in the local tone of the walls and columns.

The cap band of both was adorned by rising anthemion ornaments or by interwoven bands without direction; the beads above it gleamed with gold. The vertical band above the triglyphs and resulting from the undercutting of the cornice was decorated by a bluish-yellow or golden fret pattern on a red ground; the mutules were covered by the same blue as the triglyphs and beset with golden or red drops. The intermediate narrow surfaces and the undercut cornice were of vermilion red, the former being yet more richly decorated by golden palm-leaf ornaments. The ogee cyma above the facia had outlined and recurved leaves colored green and red, which also extended along the pediment beneath the cornice. The figures of the pediment had the natural colors; their weapons and attributes gleamed in gold and rose from a red, blue or white ground, like the reliefs of the metopes. The The cymas were adorned by golden anthemions, the fillets beneath them having a fret or wave-line, the small echinus member with recurved red heart leaves, outlined with midribs on a green ground.

Note. Compare the colored restoration of the Parthenon pediment in Durm's "Konstruktive und polychrome Details der Griechischen Baukunst." Berlin. 1880. Plates 9, 10, 12 and colored Plate III -- in which the attempt is made to leave the metopes and the ground of the pediment light. The occasion for this was the effect of the polychrome figures on a light ground on the royal sarcophaguses of Sidon. Had Fürtwangler, in his colored restoration of the Temple of Egina, placed his strongly colored figures on a light ground instead of the blue one, he would certainly have obtained a nobler effect and a more intelligible character of Grecian architecture. The tympanum of the pediment has a disturbed and too variegated effect, as it is now given.

The lions' heads of the cyma, the acroteria ornaments, and the antefixas again shone in high colors or were entirely g gilded. The covering and ridge tiles were ornamented by col-

colored leaves and anthemions.

The ceilings of the porticos, by the use of stone, had as a ground tone the same color as the walls; the borders of the c coffers were separated by gilded beaded astragals on a deep blue or green ground, the horizontal surfaces being covered by red fret patterns, the echinus mouldings next the ground of t the coffers with recwrved colored leaves, egg-and-dart mouldings or heart leaves, the ground itself being ornamented by golden stars on a sky-blue background.

The beams were covered on the under sides by painted interwoven bands, with recurved colored leaves on the echinus mouldings along their sides. The cap, that crowned the wall of t the cell and also extended above the frieze, was at top decorated by recurved colored leaves, its band having a golden fret, the ogee beneath with colored heart leaves.

The figures of the cell frieze in natural colors indeed rose from a red, blue or white ground, as for the metopes and the tympanum.

The intervals between the columns of the pronaos were filled by bronze grilles (wooden enclosures are mentioned in Epidauros; see Baunack, p. 81), which extended high, and behind them gleamed vases, drinking cups, beakers, silver lamps and the like. But even piclorial ornamentation was not lacking there; the walls of the vestibule in the Sanctuary of Athena at Platea were adorned by two pictures, painted by Polygnotos; in that at Belphi were inscribed proverbs for use in human life, such as "learn to know thyself" -- "too much in nothing" etc. Statues of bronze were in the vestibule of a temple in Corinth, marble statues of Athena and of Hermes before the entrance to the Temple of Apollo at Thebes; at the entrance to the Parthenon was placed the statue of Iphicrates; in Hermione statues stood around the Temple; the same decoration before the columns was possessed by the indeed Corinthian Temple of Zeus Olympius in Athens. In the middle of the rear wall of the pronaos stood the colossal perforated leaves of the doors of the main entrance, constructed of gilded bronze or of wood inlaid with ivory, thus forming the final ornament of the pronaos and the first on entering the sacred cell. (compare Baunack. p. 79).

Note. To the representation of the completely executed pol-

polychromy was Kugler's formerly contrasted, a partial one with white walls, shafts of columns and architraves. (Compare his Denkmäler der Kunst. Stuttgart. B. Plate 4. A). To one the f first appeared too chalky; to the other was recalled the yellowish shining tint of sauce. The natural material looks as white and as uninteresting as paper, and the weathered tint on the marbel is not really as yellow as the painted local tone, in both being expressed the ground principle, that the architectural parts mentioned must be of the lightest color on the building, whether they are somewhat colder or warmer in tone. The data concerning the coloring of the smaller architectural parts and the ornaments are otherwise approximately the same in both methods; blue triglyphs and the metopes with red grounds at Selinus, blui mutules with gilded drops and red interspaces.

The significance of the metope in stone construction, as masonry between two spaces for beams, has given cause to assume the ground of the metopes as being in the tone of the cell wall. If the latter are adorned by figures and the ground is painted, is of the light blue of the triglyphs and is finely harmonized, then does one remember little on the contrary, since scarcely anything of the ground remains, and the colors of the figures are already in contrast to the blue of the triglyphs. The colored reliefs on the so-called Sarcophagus of Alexander (Macedonian royal sarcophagi) also rise from a white marble ground a and have an excellent effect, also well in the entire harmony of colors. Here or there is the colored figure frieze on a l light ground harmonized by firm color tones in the cymas above and beneath.

Less tasteful in color is indeed the work, when the metopes exhibit no figure ornament, where it may sink into tastelessness. Furthermore if the triglyphs were colored a dirty dark blue, as stated, for example by Finger (Dorische Polychromie etc. Berlin. 1886), and there were likewise a just as strongly colored tympanum, with a white local tint of the architecture in general, then Kugler's representation becomes the full toned Renaissance decoration! The ornamentation of the capitals by fret bands and leaves, as stated, may well have occurred on capitals of moderate size and on steep forms of the echinus,

or for greater projections of this with anthemions (see Paestum), in view of the Athenian steles -- but it so far has not been proved on any existing stone Doric capital, and therefore in all colored restorations leaf decoration must be a possibility, but not be assumed as a certainty, just like the red and blue spotted annulets (see Fenger, Plates 1, 2). Annulets colored entirely red are proved, but niether on the Parthenon nor on the Temple on Egina.

What may be assumed for the metopes as the ground for the f figures may likewise be assigned for the background of the tympanum, since this is inserted masonry, like the ground of the metopes. White metopes and a white tympanum are indeed in harmony, but never white metopes and a painted blue or red ground for the tympanum. A colored ground is also not proved for the figure friezes on the Parthenon and Theseion, but it is probable, if the ground of the metopes was colored.

Further examples of colored architectural parts are also to be found in Le Bas (plates 8, II, 3, 4, 5 6). On Fenger's polychromy Heydemann remarks (Zeits. f. Bild. Kunst. 1887. p. 285-286): -- "Such a polychrome temple -- merely examine the interesting restoration of the Temple of Athena on Egina (plate 1) or of the Parthenon -- like a nude man, who on a festal occasion has placed on his head a complete wreath of variegated flowers." That is a matter of taste and not of science! (See our representation of a Doric entablature. Plate IV).

According to the preceding, the various kinds of colors depended upon the building material employed; on the soft and fine-grained limestone the color was directly applied, the sketch being first incised with the steel point and colored. (Poros architectural fragments in Acropolis Museum at Athens). Masonry of shelly limestone, walls of sundried bricks and of the less valuable sorts of stone were covered with stucco, in which the final forms of the details were first expressed, then being painted in fresco or distemper. With the use of hard and finer-grained white limestone capable of polishing, (crystalline limestone, marble), the moulded and flat work was directly finished, the colors being applied directly on the carefully prepared surface of the material. But all possibilities for polychromy were not exhausted thereby. In place of

the stucco, there occur the colored terra cotta coverings as a protecting and decorative material for the less valuable and beautiful building material, chiefly on the exposed parts of the building.

Semper writes:-- (Der Stil. Vol. 1. p. 446-447. Pl. 3):-- "mortar and terra cotta are very ancient traditional covering materials; of these the mortar is more commonly employed for covering masonry and terra cotta chiefly as the covering of woodwork. Both the external wooden timbers and the internal wooden ceiling of the archaic temple were entirely covered by richly ornamented terra cotta plates." Museums of Sicily and lower Italy (Palermo, Syracuse, Castelvetrano, Metapont, Naples etc.) are rich in terra cotta of this sort, Semper further states, and as evidence,he gives three different examples of such.

Others were already published earlier by the Duke de Luynes and by Debacq (1883), taken from the ruins of Metapont; Le Bas (Voyage Arcaeologique etc. Paris. 1847-1877. Incomplete.) added other materials thereto; Hittorf repeated and extended the same in his great work, "Restitution du Temple d'Empedocles a Selinonte, ou l'Architecture Polychrome chez les Grecs". (Paris. 1851. Plate 10. Figs. 4, 5, 6), particularly adding to Fig. 5; "serving to cover wooden timbers." Viollet-le-Duc likewise assumes wooden beams covered with terra cotta in his Plates on antique architecture.

To the terra cottas of the great Temple in Selinus published by Hittorf were added others during the seventies, that were photographed and published by Fiorelli in "Bulletino" etc. in July, 1875; other pieces were found during the winter 1876-1877 and placed in the Museum of Palermo.

These were then extended by the finds in Olympia, which afforded new points of view relating to the use of such terra cottas. The finds made at the Treasury of the Geloans permit the assumption, that terra cotta was also employed for the decoration and the protection of stone members. There is nothing striking in this, if as especially the case in Sicily, an inferior and porous limestone were covered with a solid facing, and for exposed places, terra cotta was preferable to stucco; not only that the paintings on terra cotta were preferred to

the temporary ones on stucco.

The method of fastening those usually box-like terra cottas on woodwork was made clear by the pieces in Metapont. The clay boxes, decorated by reliefs and painted, are 13 inches high and exist there in great numbers, and they have square h holes in their sides, through which copper (not bronze) nails were driven into the covered woodwork. Abruptly bent copper nails still remain in part in the holes. A greater number of such, that accurately fit in the holes, are preserved in the glass cases of the so-called Museum in Metapont (now transferred to Naples); they all measure 5.12 inches in length and are square with square heads. The metal, shape and size of the nails leave the former fastening in wood beyond all doubt; likewise the fact, that the backs of the terra cottas nowhere show traces of mortar but rather the very clean clay surfaces, which permits the assumption, that these could only have been employed on wood. Pieces from Syracuse and Selinus exhibit similar arrangements for fastening and the same absence of traces of mortar. Since certain pieces are entirely flat and have no projecting mouldings, they may have been plain middle pieces between the two box pieces. On the contrary, others again show moulded projections with conical or cylindrical holes, both on the unpainted and the painted sides. (Compare Fig. 206).

These pieces are not to be regarded as the residuum or as reminiscences of a preceding wooden architecture; they are far more to be taken as a better substitute for stucco in places, where this did not offer complete protection from rain water and injuries by weather. Between the antefixas of the Temple at Selinus, for example, the rain water flowed over the crowning member of the stuccoed cornice and would have soon destroyed this. A durable protection could only be afforded there by the use of terra cotta, as it occurred. It was caused there by the lack of a collecting gutter and was in connection with the clay tile roof, scarcely being older than that. (Compare cymas in Selinus, on the Treasury of Megara and the Treasury of the Geloans in Olympia).

The construction of a collecting gutter with water outlets did not materially change the disadvantages. Every storm must

drive the rain water flowing therefrom against the lower architectural members. Only by the connection of the gutter with the ground by a leader was this changed.

This crowning of the building by an ornamental cornice found a beautiful extension in the covering of the roof surfaces by colored flat and cover tiles and their antefixas in the decorated ridge tiles, frequently beset by palm leaves, in the angle and middle acroterias, the cymas of the pediment and its figure groups. These monumental parts must be comprised as a terminating entirety and be so judged in their effect. With the exception of the ground tint, the colors were not burned in, so that they have frequently disappeared. But the variegated burned clay products also extended yet further on the building, as for example, on the Temple of Apollo at Thermon, whose metope slabs of terra cotta were employed and discovered.

The fastening of the burned clay pieces on the porous limestone was likewise by metal pins. (Compare cornices of Temple in Selinus).

Besides the polychromy by means of burned and painted clay slabs and boxes on limestone ashlars, there may be mentioned still another, likewise monumental; that by variously colored stones, which was executed on the Erectheion in Athens, for example, and in part also on the Propyleion there. The Temple is entirely constructed of Pentelican marble, only the frieze being of bluish-black Eleusinian, which now has the effect of slate. The natural dark tone of the surface of the frieze made an artificial one superfluous. From it then rose very efficiently the freely wrought small figures in Pentelican white marble, again variously painted. (Compare Plate V; polychromatic Ionic entablature).

The existing colored restorations in the different works with plates often differ much from each other, an occurrence to be referred to the printer rather than the author.

Thus Koldewey and Puchstein stated in their beautiful work on the Sicilian temples, that a complete representation of the original distribution of colors on the entablature of the small and late prostyle Temple B in Selinus was presented. (Compare colored plate 28 and page 94 of the text in their work). In position, yes! -- but somewhat muddy on the paper. Red and

blue were directly applied to the stone, but the white only as stucco on the stone surfaces. Remarkably white stucco is shown by nearly all the ashlars of the Temple of Castor and Pollux in Akragas, that on the columns consisting of a fine yellowish coating beneath, over this being a fine white layer. The best pieces in the Museum at Palermo are all covered by beautiful white marble stucco with boldly applied colors. It is decided for the entire temple, that:--

Red occurs only on the taenia of the architrave, then on the spaces between the mutules, on the fillet above the cyma, and the cyma of the cornice.

Blue on the regulas, with the exception of the drops beneath the triglyphs, on their head band, on the metope band, on the mutules, with the exception of the drops, and on the ground on which the mutules are attached.

Black on the channels and the intersection of the Doric cymatium beneath the cyma. Yet not everywhere may be proved the black color in the channels.

White on everything else -- thus the drops, metopes, architrave, cyma, the mural surfaces, antes and columns.

I am sceptical concerning the use of the black color; I do not believe that it was originally such; for me it is a transformed blue, produced by some chemical change of the substance.

On most of the buildings in Olympia were found the following remains of colors:--

Blue of three kinds, among these being sky-blue.

Red, brownish-red to vermilion.

Yellow, as a bright tone of ochre.

Green, as an earthy covering color of soft effect.

Black.

To this should be added, that the entablatures of all Doric buildings in Olympia were painted without exception. The abacus and echinus of the capital remain without painting and were in general coated with a single color. The metopes without s sculptures remain white, or they were colored over the surfacces. For the metopes with reliefs on the Temple of Zeus, the figures were painted in several colors and rose from a light blue ground. The spaces between the mutules were always white, a characteristic for Olympia.

Only slight vestiges of colors were found on Ionic monuments. (Compare Paul Graf. Olympiawerk. Text II, p. 36. Plates 112-114; the coloring of the architectural members).

Note. A very good reproduction of the original is to be found in Wiegand's work on the limestone architecture on the acropolis; an excellent one in the "Antike Denkmäler" of the Imp. Germ. Arch. Inst., where the painting of the Ionic capitals and of the clothed female figures from the Acropolis Museum in Athens is made prominent. The original is not attained by the colored prints of Hamdy Bey in the work on the royal s sarcophagi in Sidon; colored plates in Fütwangler's work on Egina hurt the eyes.

Interesting are also the colored figure friezes on the north and west sides of the Treasury of the Cnidians at Delphi, that are beautifully reproduced in the "Fouilles de Delphi". (Vol. 4. Paris. 1907).

The cautious Penrose gives in his great work on the Parthenon slight traces of red on the spaces between the mutules and of greenish-blue on the mutules and the scotias of the triglyphs. At the latter place in the year 1868, I could still determine quite visible traces of a coating of blue color 1/25 in. thick. The outlines of the ornaments in the coffers, on the ante capitals, the friezes and fillets, Penrose shows in accordance with the actual facts. He assumes red, blue, green and gold thereon.

A further heightening of the colored ornamentation was attained by the addition of metallic ornaments, weapons, bands of gold or gilded bronze, which were attached to the marble sculptures, the eye sockets being also frequently inlaid with enamel or glass eyes, in order to make everything yet more natural. Where these are wanting, their former existence is proved by their fastenings.

So far as may now be seen, the artistic treatment of the interiors of temples in Sicily did not go beyond a painted stucco coating and variously colored terra cotta facings; their a architectural members must also have received the same treatment as on the exterior. Columns, architraves and cornices then remained white with sparingly colored ornamentation. The walls, on the contrary, must have been covered by pictures,

such as Pausanias mentions in the Temple of Theseus at Athens, for example. In the Temple of Zeus at Olympia (compare Fig. 207, from a drawing of Professor Bühlmann in Munich), according to the same author, the "enclosing wall opposite the doorway was colored blue," while the other walls were decorated by the paintings of Panämus. In the Temple at Messene, the paintings on the rear wall represented the kings of Messenia; in t the Sanctuary of Artemis at Olantheia in Pausanias' time, the pictures had vanished by the lapse of time; those in the Sanctuary of Asclepios and in the centainly Ionic Erectheion were still to be seen by him. If no vestiges of these mural pictures are yet preserved, we still have for them the evidence mentioned.

Chapels in Athens with gilded ceilings, alabaster ornamentation and pictures are mentioned; the magnificence of the ceilings with their inlays of gold and of ivory, with their mosaic overlays or bronze plates with cast work are referred to.

The decoration and splendor in the interior completed and enhanced the statues of the gods and the consecrated gifts. Shields of bronze were suspended in the Temple of Artemis Eucleia in Thebes, others and garlands in the Temple of Zeus at Olympia, with the armor of Marpessa in Tegea.(Compare Fig. 210; pa part of the ornamentation of the garment of a statue from Lycosura, also Fig. 209; statue of Pallas in the Parthenon at Athens).

On tables rested the finer and richer votive gifts; others were indeed deposited in special cases, at the feet of the statue of the god, or between the columns. The throne of king A Arimnestos stood as a votive offering in the Temple of Zeus at Olympia; likewise the bronze horse of the Cyniska and a bronze tripod were exhibited there. In the Heraion there stood, besides the ancient chryselephantine statues of Zeus, of Hera enthroned, the Horae, the noble Hermes of Praxiteles, an Aphrodite in bronze, the chest of Cypselus in cedar wood with reliefs of gold and ivory, a bed ornamented with ivory, a discus a and a table for the victors' garlands. In Tegea were suspended the fetters of the Lacedemonians captured in war, the teeth and the "hairless and rotten skin" of the Calydonian boar. F From the time of Hadrian dated a peacock in the Heraion not

far from Mycenae, made of gold and shining stones, where the shield of Euphorbus and the bed of Hera were to be seen, as well as four golden horese with ivory hoofs, then the two tritons,wrought half in gold and half in ivory in a Temple at Corinth.

From the ceiling were suspended smaller works of sculpture, as in the Sanctuary of Asclepios at Sykion; in the Temple at Mantinea the Stymphalian birds, made of wood or gypsum (also painted, since Pausanias could not determine their material), hung from the ceiling; in the Sanctuary of Hilaira Phoebe at Sparta was hung from the ceiling an egg enclosed by bands(the egg of Leda).

Thus the temple with its consecrated art works appeared as a museum, created by the piety of the people.

Interesting conclusions relating to the arrangement of the interiors of the temples are afforded by the "Delos inscriptions" published by Homolle (Bull. d. Corr. Hellen. 1890. p. 462-511) and interpreted by him. They first relate to the preservation of the temple vessels (repairs to vases, kettles, the soldering of a handle to a silver cup, to beakers, to shallow cups and the like), the purchase of a table for the Hieropois, several keys for the doors of the temple, then the insignia of a herald, clay pots or bowly for keeping silver or gold, cords, hooks, furthermore materials for beautifying the statues of the gods at festivals, on which occasions the altars must be purified, the statues washed and refreshed; old and new statues of wood and of stone must again receive polish and color on their surfaces. They were first washed with a sponge and a solution of saltpetre in water, then rubbed with oil or wax, with which was mixed a fragrant unguent (of roses), in order to make the material fragrant. For this cleansing of the statue of Artemis, for example, was required:-- sponge, 2 drachmas; saltpetre, 4 oboli; cloth and wax, 4 oboli; oil, 3 oboli; and for perfume, 5 drachmas (altogether 11 drachmas and 5 oboli). Complete conclusions relating to the internal arrangement of the temple will indeed be afforded by the further publication of the "Delos inscriptions", which relate to the entire series of chests among which the temple treasures were divided, and which state what was placed in the vestibule, in the cell

and in the opisthodome, what stood on the floor, hung on the wall, or was preserved in the chests, cases or special receptacles. By these indications shall we first obtain a complete idea of the internal equipment of a Grecian temple.

As temple vessels are to be mentioned the vases with purifying water placed in the vestibule (with which every one that would visit the temple must either sprinkle himself or be sprinkled by a priest, whereby he symbolically indicated, that he then approached the altar of the god with a pure heart) and the small altars placed in the cell before the divine statue for the bloodless offerings (the table of shewbread in the J Jewish temple). (Compare Fig. 213 from the finds at Delphi). (doubtful).

The latter were mostly made of stone (also frequently of wood), round, square or octagonal in form, adorned on their sides by the skulls of bulls, garlands of flowers and sacrificial knives, as proved by finds in Athens and on Delos. Pausanias remembered a silver altar in Mycenae. Of the different names employed for altars, "hesta, heschara, bomos", the latter is the usual one. In the most ancient times, these were of greater simplicity, artlessly built of stones or of sods; in Theocritus (26, 3 et seq.) women construct altars of brush and leaves, and according to Pausanias (9, 3, 4), the Boetians built a great altar of wood.

Note. Compare Handbuch der classischen Altertumswissenschaft. Editor J. von Müller. Vol. 14. Die Griechischen Sakralheiligthümer und das Buhnenwesen der Griechen und Römer. By P. Stengel and G. Oemichen. Munich. 1880. p. 10-23, 63-106. Also Guhl, E. & W. Kroner. Das Leben der Griechen und Römer. Berlin. 1878. p. 57 and Fig. 42. (English translation in University library). -- Lastly, Stuart & Revett. Antiquities of Athens. Part 27, plate 12(drawing of a circular altar. Stuart found a circular altar at Athens), and part 28, plate 1 (the three sides of a polygonal altar decorated by the heads of bulls).

As the highest and most venerated ornament, the statue of the god stood in a separate cell (aditon, as in the ancient temples of Sicily or the golden statue of Apollo at Delphi), or in the open space enclosed by low railings, before the rear wall of the middle aisle, its colossal dimensions often exten-

extending to the ceiling gleaming with gold, and no longer in proportion to the members and dimensions of the architecture around it. (According to Strabo, if the statues of the gods in Olympia could have risen from their seats, this must have endangered the roof of the temple). To this was added in certain temples the statues of the "associated gods," with the consecrated gifts at greater distances.

Note. As a probable model of the statue of Pallas Athene in the Parthenon may be regarded the statuette in the Central Museum at Athens.

Curtains generally concealed the precious statues of the gods, one of wool of Assyrian weaving and Phoenician purply dyeing (that could be lowered to the floor) concealed the chryselephantine statue of Zeus in Olympia. In the sacred place was also safely deposited the state treasure; the opisthodome of the Parthenon was utilized as a place of deposit; the repose of t the dead was likewise not disturbed there -- the daughter of Antropos was buried in the interior of the Artemesion at Thebes. (Indeed an exceptional case).

If the statues of the gods in the ancient period were often artless images in stone, wood or metal, they rose in the best period to art works of the first rank; architecture and sculpture competed in the temple for the palm. With the most splendid works belonged the chryselephantine statues of Phidias. Standing on a high pedestal adorned by sculptures, the nude parts of ivory, the rich garment of wrought gold extending to the feet, on the breast being the ivory Gorgon's head, the Nike (victory) on one hand with the spear in the other, the shield at her feet and beside the spear the dragon (Erichthonios), was represented Pallas Athene in the Parthenon -- the value of the gold of the garment was estimated at about $625,000. On a throne gleaming with gold, marble, ebony and ivory, adorned by painted and sculptured figures and the forms of gods, sat Zeus at Olympia, his head encircled by a garland of olive leaves, and constructed of gold and ivory, like the Athenian Pallas; on his right stood the likewise chryselephantine Nike; in his left was held the sceptre ornamented by an eable at its tip; the sandals shone with gold, and the heavy mantle was painted or ornamented with blooming lilies and small figures. (Com-

(Compare Fig. 208). But also simpler forms of less costly materials represented the gods, though often strangely opposed to our modern tastes.

Wooden statues were chiefly made in the ancient period, indeed of ebony (Temple of Apollo at Megara), cypress, cedar, pear (Heraion near Mycenae), oak, yew and lotus woods; only the image of the Cyllenic Hermes is said to have been carved from thion wood. Ivory and wood were later employed together, the latter being ornamented by gold and color, as shown by the statue of Athene in Aegira, whose face, hands and feet were of ivory, the other parts being of painted and gilded wood.

Also likewise occur statues entirely made of ivory, as for example, the statue of Aphrodite in Megara; a combination of wood and marble is shown by that of Apollo Chalinitis at Corinth, whose body was made of wood, while the face, hands and feet were of marble.

Note. Lucian in his "Zeus Tragoides" permits Hermes to say of the gods:-- "Thou seest how those from Hellas are indeed graceful, beautiful and artistically shaped, but all are of marble or bronze; only the most costly are of ivory, merely with sufficient gold to receive color and polish; meanwhile these are also of wood and conceal within themselves entire hordes of mice, dwelling there."

Small figures of cedar wood overlaid with gold were mentioned in the treasuries of Olympia, likewise an Apollo statue of beech with gilded head, and in Messene a statue of gold and P Parian marble. In Aegira, the Zeus statue was of Pentelican marble, and that of Pallas in Sparta was made of bronze.

The chryselephantine work may be carried back to about 580 B.C., and Dipoinos and Skyllis were the first artists in this kind. Many statues were also covered with temporary ornament. A temple statue in Sicyon wore a white woolen undergarment and a mantle over this; in Aegion a similar one was covered by a translucent veil. In other places the statues were further decked with garlands (in the Ino Sanctuary at Thalalä) or with myrtle twigs ("ermes statue in the Erectheion); in the Temple of Dionysos at Phigaleia, one could not see the lower part of the temple statue on account of laurel and ivy leaves; but so far as visible, it was painted with bright vermilion color.

Similar color ornamentation was exhibited by the entirely gilded Dionysos statuesin Corinth, whose faces were tinted red.

Oriental influences are recalled by some singular forms of gods, like the three-eyed (one eye in the forehead) wooden Zeus in Larissa, the statue in the Sanctuary of Eurynome at Phigaleia, which was a woman to the middle and then a fish. Directly opposed to and contradictory to the clear Grecian nature is the effect of the description of the statue in the cave of Demeter near Bassae; the wooden figure sat on a rock, had the form of a woman with a horse's head and a mane, wore a black undergarment extending to its toes, had on one side a dolphin, on the other being seated a dove.

The polychromy of the public buildings was also transferred to private structures in accordance with the same ground principles. (Compare Pompeii).

Division 7. The three orders of Grecian architecture in their formal development.

In the like sequence as for the technical construction of the building are also the elements of the three orders to be determined according to their signification in form, and to be differentiated in accordance with their different natures. The scheme of the temple must also here be taken as a basis, since in it the expression of form is most perfectly developed and most clearly apparent according to its importance. Their function is made clearly visible and is expressed by the applied ornament.

A. The Doric order.

The form expression is the same for the mixed and for the smae stone style of architecture; excepting that in accordance with the mode of construction, the plasterer and the sculptor in stone have the final words. The profiles of the various structural parts of porous limestone afford no correct idea of the intention of the artist, after losing their stucco coating. Only for structures of crystalline and hard limestone do we obtain the correct answer. The technical execution and arrangement of the jointing remains careful and similar, whether visible or concealed behing a coating of stucco. It should not participate, but the elements should act as a united whole, and the mode of joining should not appear.

a. The stepped substructure, from which rise the columns and walls, remains without ornament, even when its courses were regarded in the rarest cases as actual steps for use. Simple rectangular ashlars with smooth surfaces.

b. The enclosing walls exhibit a high course of slabs, that projects but slightly beyond the rising masonry, either resting directly on the pavement, on plain or sometimes moulded plinths. (Paestum, Parthenon, Theseion). The faces of the wall ashlars are carefully dressed smooth, the joints are not accented (merely the buildings of the Alexandrine period form an exception) and by the use of ordinary stone covered by a uniform coating of stucco, that could be left white or painted in varied colors. A repetition of stone jointing in the plaster by incising or painting is unknown on temple walls, but is not excluded on the surfaces of the facades of dwellings (Pompeii). When desi-

desired the effect of the surface without any lines, though h holding fast to the triple division of the wall in height. A moulded band cornice formed the upper termination, to which was added on the Parthenon the famous Panathenaic frieze, to this being joined beneath entirely purposeless regulas and dr drops.(Fig. 214).

c. Doors and windows.(Openings in walls). Doorways are of rectangular or trapezoidal form. On no Doric temple is preserved a perfect doorway for the cell. The jambs of the doorways are frequently composed of ashlar courses of the cell walls e extending to the opening, as such were previously shown at the doorway of the so-called Treasury of Athens, or by separately constructed plain jambs, that are interrupted by headers or adjacent lintels and are thereby connected with the masonry,(Compare Parthenon and Propyleion in Athens), while the upper termination is always formed by a massive horizontal lintel.

Cavities in the jambs of the doorways of the Propyleion, as well as holes and pins in the lintels, permit the assumption of a separate rich casing executed in marble or bronze and attached to them. [1] The doorway of a tomb in the Doric order at Antiphellos, among other examples, gives data on the treatment of the architrave of the doorway (Fig. 215). Recessed in several planes and with a richly sculptured profile, this surrounds the opening; ears on the lintel give to the whole a greater relief and expression; a crowning cap is decorated by anthemion ornaments and forms a further decoration.

Note 1. For bronze coverings, see Normand; Role du Metal dans la Construction Antique. Enc. de l'Arch. 1883. p. 61-81; pls. 878-895; with the examples from the Museum at Avenches (Aventicum) there represented.

In no species of temple of the Doric order occur windows in the cell walls; on the enigmatical structure of Olympian Zeus at Akragas, windows are given between the colunms of this pseudo peripteral building in the already mentioned works of Cockerell, Kinnard, Donaldson, Jenkins & Railton; the earlier finds can no longer be verified at the ruins. (Compare Division 8; Religious monuments).

On the left side of the Propyleion at Athens, in the building that contained the paintings and behind a row of columns, there

stands a wall, which is perforated by a door and two windows. We can at least see by this how the window was treated in secular Doric structures. The sills of these windows extend through from the side walls to the doorway as a plain rectangular sill course of Eleusinian marble of a bluish-black color, projecting but slightly from the face of the wall; the jambs are treated in the style of antes as narrow projecting bands without bases, but have the complete capital of the large antes; a higher course of ashlars also extends clear across and forms the lintel, though it is not otherwise distinguished. (Fig. 216).

If the architraves of the doorways are already uncertain, thus in a higher degree is the closing of the doorways. It should be assumed as proved, that the door frame and the leaves were of the same material, chiefly of wood covered with metal. At the Temple of Asclepios in Epidauros, according to the building contract, wooden doors were fixed on the exterior, that exhibited ivory inlays as a special decoration. [1] Vitruvius (Book IV, 6) states that in regard to Attic doors, they h had no lattice-work and also were not in two leaves; they exhibited hinged panels, which opened outward. At the Temple of Aphaia on Egina, Fürtwangler is of the opinion, that the doorways were closed by wooden leaves, simply beset by nails. Large holes in the floor indicate hinges and fastening bolts. Sill and jambs were covered with wood. The fixed railing with imposts and points elsewhere drawn by him is by its simplicity scarcely suited to the other famous fine details of the Temple.

Note 1. Compare Baunack's Epigraphische Studie; Aus Epidauros. Leipzig. 1890.

On the Tholos at Delphi (Marmaria), the doorway is still preserved to a height of about 3.28 ft., from which it may be seen, that likewise here was executed no moulded stone jamb, but merely arrangements in the ashlars, into which were fitted door frames and jambs of a different material. (Fig. 217, after my own sketch. April, 1906).

Famous were the doubel leaved doors of the Temple of Athena on Ortygia in Syracuse, a building of the 5 th century B.C. They are proved by the complaint of Cicero against Verres (IV, 55, 122 et seq.). According to the different measurements of

the Temple, now transformed into the Cathedral, the doors had the clear dimensions of 8.2 by 16.4 ft. Hence the doors were in two leaves, their leaves and frame certainly being of wood. They bore splendid decorations of ivory and gold. Of gold were the regular nial heads, of ivory being the sculptures between these, and to which belonged a Gorgon's head surrounded by serpents. [1] Without definite subdivision can scarcely be conceived the door leaves of the larger temples, on account of t the great height of the doorways, that vary in Sicily from 16.4 to 28.8 ft., attaining one of nearly 32.8 ft. on the Parthenon.

Note 1. Compare Geschichte Siziliens im Altertum by A. Holm. Vol. 3. Chaps. 8 to 11. Leipzig. 1898. Verres carried off everything, so that only the bare leaves of the door remained. He further stole from all Syracusan temples the statues, beautiful Delphian marble tables, bronze mixing jars and Corinthian vases. Moreover silver and gold vessels, golden candelabra set with precious stones, beautiful fabrics, purple stuffs, s seal rings etc. Puchstein blames Hittorf in that he erroneously represented and explained the steps with the fragments of a quadrant-shaped groove from the doorway of the Temple C in Selinus, and he has carried the left angle block of the second step to the same level as the threshold, thus obtaining space for extending the groove to a quadrant. But Hittorf scarcely had any ground for representing things otherwise, than he saw them. So many things have changed in the lapse of time on Sicilian fields of ruins, that both gentlemen may be right. Their measurements lie about 70 years apart.

Puchstein now adopts, basing it on his finds, folding doors in four leaves with a very wide frame, behind which were concealed the leaves. One would believe an arrangement of the 1 18 th century to be before him, just as somewhat changed, it was common for the night shutters of the better living rooms in the Barocco period. The utility is clear, but it is then forgotten, that for opening and closing the leaves rather less simple movements are made, than are indicated on the stones m mentioned. The left is not sufficient, and the two beginning marks on the right are very questionable. The "metal bars", by which are meant the vertical (metal ?) bars before the wall, about which the entire apparatus rotates, are placed rather t

too far from the clear doorway, and are further not proved by anything. To make the two inner leaves free, there is first required a rotation of the entire box about 45 degrees; then only do they become free, when rotated in the opposed direction. Afterwards the apparatus must again be turned into the first direction, to make closing possible. What makes the matter intelligible is the strong projection of the stone jambs beyond the leaves. But the grooves for the general closing movement are wanting. The second one on the right has no significance for the assumption made. (Fig. 218).

Suggestions are favorably accepted and they are to be termed valuable, but they must be assured by indications on the building, for they are otherwise lost in the saying, which has unfortunately become too much the fashion:-- "How it was, I know not. Nothing of it exists any longer. But it might have been thus, according to my opinion; therefore it was so!" Thereon is it further based and opposed. Door leaves 32.8 ft. high, as tall as a wooden two-story dwelling, hung on hinges, built to securely close, can scarcely be assumed. What must have been the thickness of the wood for constructing them?

In his translation of Vitruvius (p. 118-119. Stuttgart. 1865), F. Reber desires to understand by folding doors (valvae) an arrangement in two leaves, in which the two leaves are connected by hinges, only hung and swinging on pivots at one side. The remaining traces of movement do not prove this. They rather determine fixed pivots at both jambs. But he contributes to a better understanding of the dimensions in height, when he does not permit the "quatriforis" of Vitruvius (door in 4 leaves) to consist of four leaves beside each other. He divides the height, thus producing two leaves in each (four in all), each of which can be separately opened and closed. It is technically a possible and sound idea, which avoids the joiner's work of a door leaf 32.8 ft. high and 3.28 ft. wide.

Likewise from marks left by the door leaves in moving over the floor, have men endeavored to determine the number of door leaves and their connection with each other, as well as the d direction in which they opened -- whether inward or outward. A properly swinging door leaves no traces of its movement on the floor. Only when its entire weight does not rest on the

supporting pivots, especially for very heavy doors (of metal or of oak), do men resort to the arrangement of "metal tracks, on which move the leaves (or their divisions) in opening and closing" -- according to Puchstein. Hittorf expresses this somewhat more practically, when he places the lower angle of the leaf on a roller, and by this means allows the leaf to move on a curved metal track let into the stone. Whether this arrangement was in use in ancient times, I leave undecided. The traces on the floor, which entirely result from a sinking of the leaf to be moved (compare Propyleion and Parthenon in Athens, Temples C and F in Selinus), indeed chiefly belong to a period, in which the original arrangement was no longer in use or existed.

d. The columns -- earth-born, rise powerfully upward, the swelling echinus and square abacus transmit to the column the load of the architrave, and in the combination of both, art art finds time for play in the deeply cut series of leaves and the graceful moulding bound about it, the applied rosettes or the overlaid anthemion band at the lower edge of the echinus. On the contrary, the burden-bearing abacus and the echinus remain without sculpture. Everywhere the sprouting life, the technical art of ornamentation, which the lofty spirit of the order strips off, to finally pass into pattern work. At first stumpy and strongly diminished upwards, then delicately determined uniformity in the ratio of the diameter to the height with a delicate curvature of the shaft (entasis), finally dryness in details and arid aspiration of shaft and echinus.

Vitruvius requires the diameter of the column to go 6 times into its height, exclusive of the capital, so that the "Doric column may exhibit in buildings the proportions and the sturdy beauty of the masculine body." Neither in the early nor in the best period is this proportion of 1 to 6 retained in Grecian works. (It varies from 1 to 4 to somewhat more than 1 to 5 1/2, but this was exceeded in buildings of the late period, as 1 to 6 1/2 in Nemea). The columns of Corinth and Nemea may be regarded as being in their proportions the minima and maxima of the Doric order. (Figs. 219, 220).

The concaeve flutes (rhabdosis) animate the shaft and commence directly on the uppermost step of the stylobate, [1] usually

terminating in a curved form beneath the echinus. The channels have.a flat elliptical, oval of segmental form, according to the material of which the columns are constructed, and intersect each other in a sharp edge, equally delicate in stuccoed and marble monuments; only on one temple in Selinus (S) are narrow fillets left between the flutes on a few columns. Vitruvius requires for their form the simple circular arc, described from the centre of a square constructed on the width of the flute as a basis, and touching the angles of the square; the line obtained in this way agrees in the fewest cases with those preserved on Grecian monuments.(On a porous fragment on the Acropolis in Athens, the flutes are spirally arranged.)[2]

Note 2. An exception is made by an angle column of the so-called Artemesion in Syracuse with an inscription referring to Apollo on the uppermost step of the stylobate, where the flutes first begin above a plain base band 11 ins. high, bu a column of the Heraion in Olympia, and by a Grecian temple in Pompeii. Also see Die Stadt Syracus im Altertum. Authorized German translation of Cavallari-Holm's Topografica Archaeoligica di Siracusa by B. Lupus. Strasburg. 1887. p. 80, 288.

Sixteen, eighteen and twenty (twenty four extremely seldom) such flutes surround the surface of the column; the first number occurs on a few ancient monuments, and also on such as belong to the late period (for example, the Temple in Sunion); the last number is that common on Doric monuments of all eras. The Heraion in Olympia, with its columns having 20 flutes, exhibits one with 16. As shown by the columns in Sunion, the smaller number of flutes is no evidence of a greater age of the monument. Flutes are found in some buildings, interrupted by one or more incisions before they terminate, i.e., a separate necking (hypotrachelion) is cut off by them but a little below the capital. These incisions never resulted from technical causes, for otherwise, similar original conditions must have everywhere produced similar practices, and these would be everywhere found, for example on all bed joints of the drums of the columns. But no incisions at all and consequently no separate necking of the column are found on the oldest sanctuaries in Assos, Cadacchio, Metapont, the Temple of Demeter and the Basilica at Paestum, Temple S in Selinus, the Artemesion at Syra-

Syracuse, the Temples of Concord and of Zeus at Akragas and Olympia; only a single one is found on the great Temple of Zeus and Temples D and R in Selinus, the Fountain-sanctuary in Cadacchio, the Temple of Hercules in Akragas, the Theseion, Parthenon and Propyleion in Athens; but the two on Temple A in Selinus; three in Corinth, on the Temple of Poseidon in Paestum, and on the Temples of Athene in Syracuse, on Egina and in Phigaleia, with even four on a porous capital on the Acropolis in Athens. (Fig. 221).

On a second fragment of a column with spirally arranged f flutes at the last place, the recurved form at the necking is also preserved, and it has the same shape as in case of vertical flutes.

Before the broad expansion of the echinus is developed, and especially in Sicilian and Italian monuments (one example also in Tirins), there occurs a cove, into which the flutes either intersect or terminate (compare Selinus), or this is ornamented by a fully sculptured circle of leaves, finishing next the flutes with an astragal, beneath which the flutes end abruptly, only in approximately semicircular form or with corners slightly rounded (compare Temple of Demeter and Basilica at Paestum). Two such margined recurved leaves occupy the width of one flute. Some columns of the Basilicas have the ends of the flutes bordered and enclosed by a small astragal, causing the lower roll-like margin of the leaves to project even more strongly in the form of an astragal. Above the series of leaves is another half round moulding on the echinus, that according to some columns must be considered a beaded astragal. Others show above the circle of leaves an ascending anthemion ornament or interwoven bands (Fig. 222). This richly sculptu- treatment of this part of the capital disappears in the best period and gives place to several annular rings (annulets), which follow the outline of the echinus and project from it but slightly. The line of the end of the flute conicides with the lower edge of the lowest annulet; this is then made wider than the others. Three, four or five such rings occur above each other or are grouped together; but we also find annulets above the plain concave moulding of ancient Sicilian columns. (Compare Selinus). The annulets have but a slight projection

and width on the marble structures at Athens, and can only be directly executed in that material, or only in the stucco coating over coarse limestone. On the Temple of Poseidon in Paestum, we meet with a still further development of the terminations of the flutes. The edges are carried to the edge of the lower annulet and stop there quite abruptly; the form of the echinus then passes cup-like into the cylindrical form of the shaft, and the surfaces of the flutes intersect the cup-like surface in sharply drawn curves.

On the monuments of the older style, the echinus is a strongly projecting, flattened or convex, often weakly relaxed line, which in works of the best period becomes a tensely ascending and slightly projecting, nearly straight line with a quick inward curvature at the abacus; on those of the later era (as in Sunion, Nemea, and the Market Gate in Athens), the echinus shrinks to a delicate and refined, though somewhat effeminately appearing member; it is then bordered beneath by half rounds instead of annulets.(Compare the capitals found in the excavations between the Theatre of Dionysos and the Odeion in Athens). A tangent drawn to the curve of the echinus at its lowest point often scarcely makes an angle of 30° with a horizontal in ancient structures, while in those of the best period, this increases to one of 55°. (Fig. 228).

A square covering slab, the abacus, sometimes exceeding the echinus in height and sometimes inferior to it, projects very little or not at all beyond the greatest projection of the echinus and forms the termination of the capital; this has to make the transition from the circular to the rectangular form, to receive the horizontally supported structural members of the entablature, and to afford them a firm resting place. The echinus and abacus remain in all periods without sculptured ornamentation; small bordering or crowning mouldings first occurred on the abacus in the later period (compare capitals from Athens); sculptured decorations of the echinus are unique and are only to be found on the small Doric-like capitals above the head-cushions of the caryatids of the Ionic Erectheion, if may or should in a general way be included among Doric capitals.

Though sculptured ornament was excluded from these portions, decorations painted in colors and harmonising with the ornamen-

Ornamentation of other members were the more abundantly employed. Vestiges of painted ornamentation on the echinus and abacus of a Doric capital are no longer to be traced in any building, but its form may be learned from fragments of allied members and from paintings on vases. The echinus of the Ionic and caryatid capitals exhibits ovate leaves, partly sculptured and partly painted; the fret pattern occurs frequently enough on band-like members, so that both forms of ornament may be assigned to the members in question. Instead of the ovate leaves pointing downward (egg-and-dart moulding), the anthemion ornament is found in paintings on vases aspiring upward, so that an upward or downward pointing ornamentation symbolizes opposition, a crowning or a compression.

Semper recognizes in the oval leaves nothing more than a series of conventional unities, by which "above" and "below" are indicated in the form, while Bötticher everywhere holds them to be recurved leaves, half covering themselves.

On the strongly projecting capitals of Selinus and Paestum, the decoration of the echinus by recurved ovate leaves appears disproportionately coarse in comparison to the other ornamentation, even seeming monstrous.

The employment of decorative elements of opposed directions on the same architectural member may not be surprising, in so far as one is justified in regarding this form as compressed and as opposing this pressure. The anthemion and egg-and-dart ornaments also occur everywhere as decorations of the cymas of the pediment cornice (compare Parthenon and Propyleion in Athens), and on the same members are again found the upward aspiring and the descending ornaments.

On the Francois vase, two forms of Doric capitals occur on the Doric buildings painted thereon, one having a disk-like projecting echinus capital with rectangular abacus, the other with a pear-shaped transitional member and a moderate projection. Similar forms are found on other vase paintings of the earlier period, for example on the hydria in the British Museum (Fig. 225) and the vase with the women's bath.

The pear-shaped capitals preferably have been assumed to be inventions or fancies of the painter; but the evidence for t them in stone has been found in the steles or the supports

for consecrated gifts, which were discovered in the so-called Persian rubbish on the Acropolis of Athens, and which are now exhibited in the Acropolis Museum there. They are remarkable for the colored decoration of the abacus, here circular, by interlaced fret patterns, and of the cymatium by anthemions turned upwards and downwards. (Fig. 226). Bötticher's theory of the recurved leaf does not apply here.

As works of the late period are to be designated the forms of capitals from Priene, Myus and Athens. The abacus receives a crowning fillet; the annulets are changed into astragals.

The Cypriote capitals (see Golgos in Fig. 226) with their simple forms of the echinus must also be of high antiquity, and have likewise received their development in the same heavy manner in the Athenian marble stele capitals, excepting with the difference that the abacus assumes the circular form.

One of these Cypriote capitals (Fig. 226) exhibits grooves on the cyma extendind in a direction nearly normal to the profile. Similarly arranged are also the varied scale bands on the Athenian stele capital, whose colors are indicated, and whose abacus again exhibits the feet ornamentation. Other allied capitals show the recurved leaf on the echinus, as on the cushions of caryatids, or an aspiring palm decoration. [1]

Note 1. We had already 25 years since mentioned the possibility of the decoration of the echinus with reference to the cymas of the Parthenon and Propyleion, but in consideration of Bötticher's theory, slight attention was paid thereto. Borrmann now states:- (Stelen für Weigeschenke auf der Akropolis zu Athen. Jahrb. Deutsch. Kais. Arch. Inst. Band III, p. 279, Berlin. 1888). "It may not be denied, that the ornament is very frequently in a quite loose relation to the structural form covered by it, and it is manifestly not in the ideal combination required by Bötticher's theory. The egg-and-dart m moulding is in some places without tectonic meaning, and the scale ornament is merely a covering decoration, but is nowise characteristic. The leaf wave that separates the lower from the upper row of leaves is distinctly separated from the recurved parts and makes it at least doubtful, whether we have to accept with Bötticher the origin of the Doric cymatium as a result of loading, with the points of a series of recurved

leaves."-- Consequently, the ornament does not appear to be intended to manifest the statical function of an architectural member, and it is then always arranged for a purpose, i.e., it closely adheres in development and direction to the movement of the profile.

A third very ancient torus form of capital exists on the columns of the Lions' Gate and of the so-called Treasury of Treasury of Atreus in Mycenae. Between the square abacus and the round torus is attempted a preparation for the transition, but its form is not definite and clearly expressed, and the transition from the torus to the shaft of the column is made by a cove, covered by a row of leaves.

The row of leaves beneath the echinus (painted) is shown by the old capital of the column of the Tomb of Xenvares [2] and is sculptured on the capital from Paestum, where to the row of leaves are also frequently added anthemion ornaments or connecting bands (Fig. 226). In Mycenae, the entire torus was c covered by plaited and volute ornaments, while in Paestum only the lower portion of the strongly projecting echinus was decorated.

Note 2. See Fig. 226; also Buchstein, Das Ionische Capital. 47 Program zum Winkelmannsfeste d. Arch. Ges. zu Berlin. Berlin. 1887. p. 47.

The old capitals in Selinus likewise have the cove between the echinus and the shaft.

A widely projecting form of echinus (disk-like) is shown by the capitals of columns on archaistic vases (see in Fig. 226. a lecythos found in Athens), by the stele capital of Xenares, and after these, by the capitals of the oldest period in Paestum, Syracuse and Selinus.

The strong projection should be referred to an original rectangular form of capital, projecting on two sides only, as shown by the Athenian stele cap (Fig. 226), to which we have added a form from the Asclepion in Epidauros, certainly of a later period. The widely projecting echinus form of the narrow end of the capital is here undeniable, and it is technically justified after its use in Epidauros.

But in addition to the echinus, the cymatium also occurs as a characteristic part of the capital of the free column, ind-

indeed above an octagonal or circular shaft (Fig. 226).[3] The abacus then corresponds to the form of the shaft and is consequently octagonal as well as circular, and the cymatium is a connection of the cove or ogee and the recurved leaves.

Note 3. See Le Bas. Voyage archaeologique en Grece et en Asie-Mineure etc. New edition by S. Reinach. Paris. 1888. Also Antike Denkmäler. Pub. by Kais. Deutsch. Arch. Inst. Berlin. 1888. Bl.29

The ogee or pear-shaped capital of the Francois vase and of the Athenian stele cap from the Persian rubbish has not certainly found acceptance in the stone architecture of the Greeks, just like the heavy torus of the Cypriote and of the corresponding stele caps; but on the other hand, the dish-like form with the cove and leaves came into use and was retained almost until the time of Pericles.

The cymatium also -- the compound form -- was not accepted for the columns of the building, but indeed for crowning the antes. In capitals of the early period, we therefore see elements introduced from Asia Minor; in the shaft, we recognize the Egyptian stone column!

According to the stele cap found in the Persian rubbish,(Fig. 226), the assumption may well be permissible, that the Greeks had quite early replaced the wooden post by the stone pillar, and indeed before they introduced the massive stone columns of the Egyptians in their architecture. We have pointed out this primitive stone model for the capital and shaft of the Doric column, and in this,and not in the former, is to be sought the original and the transitional forms from wood to stone.

That the Grecian stone structures were a direct imitation of wooden structures is justly contested by Hübsch, Bötticher, and Viollet-le-Duc, since this method would be opposed to reason. [1] One would make the same error by assuming the ancient Doric stone buildings to have been a direct imitation of exclusively wooden structures, as if it were desired to make it incredible,that they should have been primarily conceived as stone structures. If the ancient writers commonly mention old wooden columns in Grecian sanctuaries, which were gradually replaced by stone columns, both certainly had forms differing

from each other. The greatest measurements of wooden columns, that we have found in old wooden buildings(on this side of the Alps) do not attain the diameter of 4.26 ft. required in the Heraion at Olympia, for example. The ancient wooden columns mentioned certainly had a different form. [2]

Note 1. Also see Dieulafoy. Part 2. p. 51.

Note 2. We cannot rise to a belied in wooden columns with clay capitals made on the potter's wheel, as Fenger suggests in order to explain its forms. Dorische Polychromie etc. p. 16. Berlin. 1886. -- If we transform the probable capitals on the hydria mentioned into the circular form (Fig. 225 b), there results a technically impossibke and esthetically monstrous form. But if we assume a wooden cap, this interpretation may be regarded as satisfactory on both sides, and we are saved from an absurdity.

The capitals of the antes showforms entirely different from those of the free supports, as soon as they are regarded as the ends of walls, while those of half columns and of coupled columns are of normal form. (Fig. 188).

One peculiarity is still to be considered in colonnades; t that in a remarkable manner the Grecian feeling for beauty did not fail to permit columns of entirely unlike form on the same building, freouently beside each other.

The model being premised on the Doric Heraion at Olympia ((Fig. 227),[3] there may be paced in the foregbround as the greatest example, Temple G, the colossal structure dedicated to Apollo in Selinus with its columns 54.12 ft. high, where beside each other were arranged three different forms of columns and capitals. Perhaps even a fourth and a fifth might be added thereto, since for 21 out of 54 columns, their forms are no longer to be determined.(See Fig. 228, the ground plan a and elevation b with the forms of capitals, one of which belongs to the oldest period, with thin shaft and rounded cavetto between echinus and shaft; the other shows a recessed cavetto, and the third has the straight form of echinus without cavetto of the latest period).

Note 3. In Fig. 227 (2 and 3), we cannot refuse to exhibit the procedure by which Egyptian artists translated a possible

precedent wooden architecture into stone, that is tolerably acceptable. A square block of hard wood with the width of the beam is inserted between this and the round shaft, but without the intervention of a "cake-like" turned disk. This is a transition member from the cylindrical shaft to the square abacus, a form of stone construction and not of carpentry.

Although thes facts have been known very long (See Hittorf), before the occurrence of the same thing on the Heraion at Olympia, no one had the sublime idea, and thence to establish for Selinus a successive change of wood into stone columns, according to their disappearance and the changing fashion, until it finally appeared in Olympia! The erection of the Temple is referred to the middle of the 5 th century. The eastern half of the southern side has the swelled cavetto capital, the western half of the southern side has the steeply inclined capital with the cavetto, on the western side being the steep capital without a cavetto. (See the disignation in plan).

The otherwise freely treated intervals between the columns on some Doric temples and stoas were closed by parapet walls or grilles, as may be seen from the arrangements for fastening them to the shafts of the columns. Ashlar walls of moderate height between the columns of Temple F in Selinus were shown by Puchstein (Fig. 229).

Protecting walls between the columns, 8.07 ft. high and built of thin courses of marble, are also determined in the Doric portico of the Market in Priene.(See Priene-Werk. p. 191).

e. Besides the column and the pier, the Doric style also gives us the human figure as a form supporting a burden, in the shape of atlantes nearly 26.24 ft. high -- nude marble figures, that with arms thrown back and in a stiff military attitude support entablature blocks in the Olympeion at Akragas. (Fig. 230).

These sculptures are kept in severe archaic style. Regarding the locality of their introduction on the Temple, opinions differ. Formerly referred to the interior, Puchstein made the attempt to transfer them to the exterior, when he made them supports of the architrave in courses, not detached but resting on the cell wall. Conceding this, there follows a light-

lighting of the pseudoperipteral structure by windows in the cell wall, or the arrangement of such was limited to the pediment ends, similarly to the pseudoperipteral western facade of the Ionic Erectheion.

Colossal forms of satyrs (strongly restored), that supported cornices and were executed in Grecian marble -- four beside each other --, are found in the Louvre Museum.(Fig.281).

As an unusual crowning of a half column and pier by a Doric echinus capital and by the projecting body of a bull may be taken Fig. 282, from the Temple of the Bulls on Delos.

f. The entablature.-- The architrave (epistyle), frieze (triglyphon), and the cornice (geison) together compose the upper termination of the building.

To the following may be prefixed a representation (Fig. 283 a, b), which then repeatedly recalls, what a change must have been experienced from wooden architecture, based on the same structural system, in its transition to the stone form. Neithin construction nor in the external appearance of the two is a direct connection now to be recognized. The ceiling in the stone structure lies above the cornice, but on the contrary in wooden construction, it lies directly on the architrave, that solely and alone in both wooden and stone construction exhibits the same external appearance and the like structural procedure,with the same position directly above the free supports. The frieze and cornice have become ornamental accessories, no longer expressing a function with a structural basis, still further compulsory evidence of which is afforded by diversity in the method of execution and by technical construction.

The front surface of the architrave is usually designated as excluding ornament. And yet one such with scroll ornaments is determined on ancient terra cottas (Fig. 286, b). Similar ornament was also not refused on stuccoed buildings, but this can no longer be prowed, since the stucco has chiefly disappeared. On buildings of dense or crystalline limestone was found no ornament, or rarely such as must be designated as temporary or applied later, that is proved in the form of inscriptions or suspended trophies (weapons and shields). (Figs. 286, c, d).

An exception is made by the ancient Temple at Assos (Fig. 236 a), at which the front surface of the architrave is decorated by a continuous figure frieze.

The architrave is crowned by a plain band with regulas and drops beneath the triglyphs, that were covered only by painted ornament. The lower surface of the architrave is wrought smooth, like its surface toward the cell wall, and it bears no ornament of any kind. In place of the taenia with regulas and drops, there is generally only a plain band on the inner side of the architrave, or that projects somewhat beyond the frieze. The drops partly hang free and are partly in contact with the surface of the architrave, firmly joined to the latter. They are of cylindrical or conical form. (Fig. 237).

Triglyphs and metopes compose the characteristic decoration, since the forms have nothing more to do with the construction in stone. To the regulas and drops on the architrave correspond the three channels in the frieze. There are two entire channels of triangular or semicircular cross section (Metapontum), with one at each angle. In the best period the channels are rectangular, ending at the top in gable or arched forms, when the oblique surfaces of the channels are extended higher than the outer terminal form. The resulting undercutting (scotia) gives a stronger effect of shadow at the upper end of the channel. In the late period the upper ends are cut rectangular and beveled. A head-band with a band or beaded astragal, projecting only in front, crowns the triglyph. Painted ornament is indicated on the band. Otherwise the front surfaces and the channels are in a single color. (Fig. 238 a).

A peculiar masking by varied emblems occurs on the small Propyleion at Eleusis. (Fig. 238 b).

Between these triglyphs are inserted the metope panels with their decoration by figure reliefs, by sculptured rosettes f filling the entire square, or by plates of terra cotta. (Epidauros, Thermos, Athens).

On the Temple with the ancient sculptures in Selinus, the spaces between the triglyphs are first shaped as flat recesses, enclosed by a sill resting on the architrave, two narrow side jambs and a lintel slightly projecting beyond them; the background forms a smooth vertical surface, from which rise

sculptures executed in high relief representing the deeds of Hercules, Perseus etc.(Fig. 239 a).

At other places, moulded bands (Phigaleia) or plain head-b bands crown the metope panels. The frieze extends simple and plain on the side toward the cell wall without painted or relief ornament, and it bears a projecting moulded and painted moulding as its termination.

As a beautiful example of rosettes as metope ornaments may serve that in Epidauros (Fig. 239 b, c).

The entire arrangement of the triglyph frieze is symmetrically transferred to the end walls of the pronaos and of the opisthodome, but is not continued along the longer sides of the cell.

An angle triglyph terminates the frieze (Figs. 240 a, b; front and diagonal views of the same in Phigaleia).

Otherwise, indeed also more thoughtful and better, appears the solution at the Parthenon, where instead of the triglyph frieze, the figure frieze is continued on all four sides, and which was retained in an allied manner on the Theseion likewise, but with the limitation to the two ends.(Figs 240 c, 241, 242, as well as a portion of the frieze of horsemen, from the original slabs in the British Museum, Fig. 243).

At the Parthenon were retained the regulas and drops beneath the frieze, which leads to the conclusion, that a triglyph f frieze was originally planned, but which was omitted during the construction. In place of the taenia with the regulas and drops, there occurs on the Theseion a painted ogee member beneath the frieze. Thus on one end the frieze and with it the architrave also is continued to the outer portico, but at the other it extends only to the antes of the cell wall.

The main cornice first consists of narrow slabs of rectangular cross section arranged beside each other, that project strongly beyond the triglyph frieze, and almost entirely conceal the same in depth -- thus terminating it and affording protection. The front surface is usually crowned by an ogee moulding at top, on which painted or sculptured wide and flat leaves are arranged; the crowning moulding is sometimes wrought in one block with the cornice, sometimes placed separately on it. It shows beneath a narrow and deeply undercut projec-

projection (fillet with water drip), always marked by strong color, from which the slab is obliquely cut back to the front surface of the frieze, thus lessening the weight of the projecting portion and preventing the rain water from running back. The oblique surface is generally stopped against a vertical surface or band (see Parthenon, Theseion, temples in Selinus, Phigaleia and on Egina), produced by undercutting, and that projects but little beyond the head-band of the triglyphs. This band is also reduced in height on some monuments, then ending in ogee form against the triglyphs.(See Propyleion in Athens, fragments from the former Bourbakeion Museum there a and in the Museum at Palermo).

Corresponding to the triglyphs and metopes and of equal width with the former, the lower oblique surface of the cornice is covered by rectangular plates cut on it (mutules, viae), that are separated by incisions and ornamented by drops, three in depth and six in width (eighteen in all), cylindrical or conical pegs. These mutules abut against the vertical band (Parthenon etc), are joined together at the rear by narrow b borders (Propyleion in Athens), or they are cut entirely free and separated by incisions, lie beside each other on the inclined surface (see fragments from Athens).

The centre of each mutule coincides with the centres of the triglyphs and metopes. Since the mutules on most monuments are of equal widths, but the metopes are wider than the triglyphs, the magnitude of the separating incisions depends on the difference in the widths of the metopes and triglyphs. On earlier temples, for example on that with archaic figure ornament at Selinus, the mutules over the metopes have merely half the width of the triglyphs and are beset by only nine drops (Fig. 244). On poros (limestone) architecture on the Acropolis of Athens, the mutules have but two rows of drops in depth, and the mutules above the metopes have but four in front. (Porosarchitekturen. Pl. XIII).

One peculiarity is yet to be mentioned. At the places where the guard portico and the pinacothek join the middle building of the Propyleion in Athens, the mutules are wanting in the horizontal main cornice. There yet remain the regulas and drops of the triglyphs over the antes placed nearest the mid-

middle building; the triglyph itself no longer exists. The head-band of the architrave and of the triglyphs is extended above the plain surfaces of the walls, and the still preserved crowning main cornice here consists of a deeply undercut cornice slab crowned above by a small moulding, that is transferred to the vertical wall in ogee form, and returned at a right angle, extends to the side wall of the central building. (Fig. 244). The present condition of the monument, the absence of the cornice blocks from the places mentioned, no longer permits recognition of how the transition from one moulding to the other was arranged.

The form of the main cornice resulted from practical needs. Besides being the termination upwards of the walls, and protecting the lower richly decorated parts of the walls beneath, sheltering the sculptured and painted frieze from wind and w weather, it must throw the rain water falling on the roof as far from the walls as possible, for which purpose were arranged the deep undercutting and the water drip. This principle is common to all three orders (Fig. 245). Satisfying a purpose in beautiful forms is the basal requirement in all parts of Grecian architecture.

This main cornice is uniformly carried around on all four sides of the temple. Corresponding to the angle triglyphs, at the angle of the cornice are found the mutules at right angles to each other, leaving in the planes of the narrow separating spaces, a square open area on the underside of the slab, that was decorated by a painted anthemion ornament.

g. Over the main cornice rises at each end the pediment, as the most expressive external decoration.

It receives the most prominent sculptured decoration of the house of the deity, that shone from afar in its dignity on t those approaching, entrancing both their eyes and souls, from a protected recess enclosed by the strongly projecting cornices of the roof and standing firmly on the bold (horizontal) cornice. The deeds of gods and of heroes were represented in them; unconsciously was the spirit aroused and prepared by t this exhibition in one bringing offerings, long before visiting the sanctuary; his thoughts were diverted from external things, and he was himself confirmed in faith in the power of

the deity by the view of the representation of his deeds.

At the Parthenon was the birth of Pallas (Athena) on one of the pediments, on the other being represented the contest of Poseidon and Pallas. [1] On the Temple of Zeus in Olympia, the chariot combat of Pelops and of Oinomaos with Zeus as the great central figure between the champions was on one, on the other being the combat of the Lapithae and the Centaurs at t the marriage of Perithoos, where the hero Theseus drives away the centaurs with his axe. In Tegea was on one tympanum the Calydonian hunt, and on the other the combat of Achilles and Telephos. On the Heraion at Thebes, the tympanums were filled with the works of Praxiteles representing the labors of Hercules. In Delphi, Artemis, Leto, Apollo and the Muses stood in the pediment; Dionysos with the Thyades adorned the rear tympanum. In Egina were battle scenes from the Trojan War -- P Pallas protecting the corpse of Patroclus etc. (Fig.246).

Note 1. See Sauer, B. ***Die*** *Standplatten der Giebelbruppen am Parthenon. Antike Denkmäler etc. Vol. 1. p. 48-51 and Pl. 58 A, B, C. Berlin. 1891. (Particularly the sections on the arrangements for setting the figures, marks of fastenings, new forms in tympanums (patina), of western and eastern pediments):-- further the Parthenon drawings of Nointel's Anonymous, those of Carrey (in Antike Denkmäler etc. Vol. 1. p.2 and Pls. 6, 6 A. Berlin. 1891).*

With extraordinary skill is the composition, wrought in the round, fitted into the enclosure. Standing figures in the middle, which are followed by bowed, kneeling and lying figures toward the ends of the pediment. Metal accessories and colors enhanced the effect of the decoration in relief.

The simplest enclosure of the pediment is shown by the Megaron of Demeter near Selinus (Fig. 247, after Puchstein, p. 87), with the plainest moulding of the horizontal and inclined cornices, and a tympanum without ornament and with a care for the possibility of leading away the rain water properly.

The oldest remaining relief and painted figure ornamentation in a Doric pediment is shown by the poros (limestone) structures on the Acropolis of Athens (now exhibited in the Acropolis Museum), where the angles of thep pediment are skilfully filled (Fig. 248) by the bodies of serpents, "the triple long-

tailed monster, generally called Typhon."

There are further preserved to us the figure decoration of the Temple of Aphaia on Egina (originals in Glybtothek at Munich), that has experienced through Furtwängler a novel and interesting change in its exhibition.(See colored print on plates 104 and 106 in his work), further that of the Temple of Zeus at Olympia (see the originals in Museum at Olympia) and those technically most perfect, of the Parthenon, executed in white marble (originals in British Museum at London). In Olympia and Athens, the figures in the angles of the pediment are at smaller scale than the colossal forms in the middle of the pediment. Both have an unquiet and less monumental effect in comparison with the composition on Egina, which is alone correct, considered from an artistic standpoint; particularly in the unity of scale of the figures. However highly and wonderfully in technical skill are to be prized the remains of figures on the Parthenon, they as little satisfy the requirements, that must be established for similar works in regard to repose and truth of harmonious proportions.

The cornices enclosing the pediment no longer show the same form as the horizontal main cornice. The projecting cornice, water drips and oblique intersections, as well as also the m members transferred to the tympanum have indeed remained, but mutules and vias are wanting. In their places occurs on the Athenian poros (limestone) structures a plain inclined surface or one painted with lotus flowers or flying birds (Fig. 249, after Porosarchitektur, plates I and II, by Th. Wiegand. Cassel-Leipzig. 1904), for a projection of the cornice of 1.54 ft. -- The case is again different with the ancient hexastyle building (the so-called Temple of Demeter) at Paestum. Delagardette (Paris, 1829) first gave information concerning a f form of cornice on pediment and side entirely unusual on Doric monuments. Koldewey and Puchstein have treated the matter more definitely, incited by the find of an angle block of the cornice.

The change from the normal cornice consists in this, that above the triglyph frieze a projecting slab does not form the termination, but an ovolo decorated by foliage, that extends around the building. Over this and extending along the in-

inclined pediment then begins a coffered and strongly projecting stone cornice, indeed once crowned by a terra cotta cyma. The coffered cornice is partly still in place on the pediment; the angle block was found and shows its continuation on the longer sides, but which could not follow the direction of the inclination of the roof, but was perpendicular to the vertical wall surfaces. (Fig. 250, after the restoration by Puchstein on his page 23).

"Examples are deceptive." According to later investigations, it is assumed for the temples in Selinus, that from the mutule cornice was laid another ashlar course, that was covered by terra cotta plates.

Puchstein repeats the section given by Dörpfeld and Cavallari (Fig. 251) for Temple C (page 108) in a somewhat modified form, when he places the gutter tile horizontally on the cornice slab, thus producing a neutral surface 3.94 ft. wide between the front and inclined covering tiles. Cavallari and Dörpfeld avoid this arrangement, when the former proceeds in a technically correct way by laying the covering part of the gutter tile sloping, thus making possible a rapid removal of the rain water, while Puchstein creates a not tight receiving gutter. Puchstein further extends this impossibility, transfers it to the pediment and there produces self-evident bent cymas (Fig. 251), basing this upon similar bends on some Phrygian rock-cut tombs of the ancient native style and on analogies to the later Treasury of the Geloans at Olympia.

The pediment cornices on all temples are crowned by "cymas" of stone or of terra cotta, that stop at the angles of the pediment and longer sides, but which are also frequently continued on the longer sides. On some and especially the older monuments are they flat and decorated by painted anthemion ornaments, on others being delicately carved in echinus or ogee form. (Fig. 253). Instead of the severe painted decorations, there occur on the later monuments, and especially on those of the Alexandrine period, scroll ornaments on the front surfaces executed in relief. (Figs. 254, 255; Temple of Asclepios in Epidauros and the Tholos near Delphi). With a straight upper edge in Delphi and a curved one in Epidauros. If the cymas extend along the sides, then the rain water is led away

through brightly colored lions' heads or funnel-shaped spouts, likewise painted. [1] If water gutters are lacking on the sides, then occur antefixas executed in marble or painted terra cotta as ornaments of the edge drip.

Note 1. Fig. 232. Among the Hellenes, the lion had the symbolical meaning of the guardian of the spring; therefore from lions' heads with them also flowed the sacred water. These lions' masks as water spouts at the edge of the roof were first used by Butades, the Corinthian sculptor in terra cotta.

The three angles of the pediment are particularly emphasized and characterized by sculptures of various kinds, for example as chimeras, fanciful animal forms, little figures, or ornamental compositions formed of scrolls and palm leaves, such as are also found as caps of grave steles.

According to Pausanias, there were in Olympia gilded prize vases on the cornices of the Temple of Zeus, with a gilded Nike (victory) exactly above the middle of the pediment, beneath whose figure was fixed a golden shield, on which was fastened the Gorgon Medusa in skilful workmanship with an inscription beneath it. On one of the treasuries is mentioned a shield above the apex of the tympanum. [1]

Note 1. The recovered inscription on the stone base, that was set on the apex of the pediment and base of the shield of Tanagra. (See Arch. Zeit. 1882. p. 179-188). Figure acroterias on the ridge of the Temple of Delos are determined and arranged by Furtwängler. (See Arch. Zeit. 1882. p. 335-346).

See likewise the splendid middle anda angle acroterias in Pergamon (Pergamonwerk, V. Trajaneum) and on the Artemesion at Magnesia-a-M., and their reproduction in the art forms. The parts were tenoned together and also fastened by metal pins, or set on plinths (Magnesiawerk, p. 67). Remains of the marble acroterias of the Parthenon in the Acropolis Museum at Athens.

Acroterias in volute form on early Doric buildings have only first become known recently. Found in the rubbish on the Acropolis of Athens, they were first published in "Antike Denkmäler", issued by the Kais. Deutsch. Arch. Inst. Vol. 1. Heft 5. Berlin. 1891.(Fig. 256 a).

The stone acroterias of the marble roof were preceded by

those of clay for the tile roof, and the latter by those of wood for the roof with wooden cornice. Examples of the latter are preserved to us in the Phrygian rock-cut tombs, in which the face-boards of the foremost pair of rafters extend far above the intersection at the apex, as we still see in the Tyrolese wooden houses, forming a characteristic decoration.

Middle acroterias in solid circular form were already determined in 1848 by Le Bas (Voyage archaeologique en Grece et en Asie Mineure. Paris. 1848); similar ones in terra cotta were published in 1882 in the German "Olympiawerk". (Fig. 256 b).

Remains of the marble acroteria scrolls of the Parthenon a are exhibited in the Acropolis Museum of Athens and were earlier made known by English publications; those of the Temple of Aphaia on Egina were completed by Furtwängler in accordance with new finds and based on allied forms, that are exhibited in the National Museum at Athens and in the Louvre Museum. Figs. 257 and 258 give Furtwängler's restoration in comparison with the actual earlier condition as well as the recovered base.

h. The stone ceilings of the enclosing porticos imitate t the wooden coffered ceilings with framework crossing at right angles, that are often stepped inside with echinus-like intermediate offsets, without the use of relief ornament.

On the Temple in Phigaleia the panels are the square coffers of unequal dimensions, alternating with those of lozenge form. Another reason for a later date of erection than that usually assumed, to which also correspond the Corinthian capital and the partly **wilder** sculpture.

Lozenge-shaped are likewise the divisions of the ceiling of the stone annular portico of the Tholos in Delphi (Fig. 1 156), where the ornaments are again merely painted.

On the Tholos in Epidauros, the ground of the coffers is d decorated by very beautiful and freely wrought marble rosettes, the arrangements for fastening which are still recognizable on the ceiling slabs.(Fig. 259).

The structural and formal treatment of the wooden ceiling of the cell is beyond our judgement, since all safe starting points for at are wanting. All attempts at restoration remain

more or less hypothetical.

i. A mixed Doric style of architecture has been preserved to us in the fragments of a Corinthian-Doric Temple at Paestum, where the capitals of the columns are like Corinthian, b but the architrave and triglyph frieze are purely Doric with Ionic dentils above them, which together have a Doric cornice with mutules and vias as a termination. The elevation, partly restored by Morey and Puchstein, belongs to the late series of forms of the Hellenic-Italian mixed civilization. (Fig. 260). On the north portico of the Market at Priene is executed on the entablature a rather modestly restrained mixture, since there only Ionic dentils are inserted between the triglyph frieze and the cornice.

k. The ornamentation of the Doric order chiefly moves within a strictly restrained play of lines, in regularly arranged conventionalized foliage (heart and egg shaped leaves), in r rows of beads and disks, in scroll work, palmatiums and volute-like scrolls, wherein painting plays the leading part.

B. The Ionic Order.

The civilization of Assyria and Egypt had already been highly developed for a long period before the forest covered shores of western Asia and of the islands adjacent thereto could exhibit results in the domain of architecture, that proved a similar culture and intellectual development of their builders, as in the countries first mentioned. Civilization had indeed proceeded very far in both centres of culture, when it first commenced to dawn in Greece and Asia Minor.

Peocples emigrated from these centres at an early date, attracted by the favorably located plains of western Asia and the fine climate.

Fifteen centuries before Christ, we see the Egyptian princes of the 18 th dynasty undertaking campaigns into western Asia, also Rameses the Great two centuries later, and two centuries later still, a movement of the people from Asia toward Europe was reflected back from the neighboring European Greece upon the Asiatic islands and coasts.

The Aryan and Semetic races met and mingled there, Assyrians and Egyptians left their traces, the mobile Semites and the people of Tyre and Sidon there carried on traffic with distant

races in the interior and on the coast.

Under such conditions, the art style that developed in this country necessarily received a peculiar stamp, but still lacked originality.

For building, there existed in this province a superabundance of wood and of stone; Aryan wood construction and Semetic stone construction are here found beside each other. The ancient wooden construction is proved by its imitations on the Lycian and Carian rock-cut tombs.

In the mixed construction, the walls were built of regular and irregular stones, the door and window frames, the ceilings and roofs, and even free pillars, were of wood, while the roofs were covered with mixed straw and clay, and later with burned tiles. The easily wrought wood led to the use of sculptured ornament; its lack of durability required a protecting coating, which was in the form of a covering of color, as rich painting in striking hues, or it consisted of a covering of metal and terra cotta.

The massive quays, terraces and stone rampart walls in western Asia, which bore the really half-timber structures or the warehouses and storehouses of Phoenician merchants built in stone and wood, or served to form or protect harbors and landings, and the mighty temple terraces of Jerusalem, still supply in their ruins eloquent evidences of the stone style of the Semites prevailing in western Asia at an early date. The element, to which these merchants owed their place and power, required massive and monumental fortifications against its might, as well as the prevalence of the easier use of wood in the preparation of the equipment for traffic. In their chief settlements, and with reference to their business and the manner of their acquisition of the country, it became necessary to see that it afforded both materials in abundance.

Certain Cypriote buildings are likewise evidences of a mixed style of wood and stone, in which are found free wooden p pillars between stone bases and capitals.

We learn from Strabo, that on account of the lack of stone in Babylon, columns were made of palm trunks, which were covered with reeds and stucco and then painted. The Bible informs us, concerning the erection of the Temple and Palace of

Solomon, that their foundations were "of costly stones, cut to the square, their wood-work sawn with saws, on all sides, from the ground to the roof."

The king of the Jewish people, skilled in stone construction, turned to the Tyrian Hiram with the request; "Command that cedars be cut in Lebanon---, for thou knowest, there is none among us, who is skilled in hewing wood, like the Sidonians." He covered Temple and Palace with cedar wood, built "cedar" partition walls, wainscoted within the entire Temple with "cedar alone", ornamented it with turned knobs and flower-work, "so that no stone could be seen." He then covered t the wooden portions with pure gold, had carvings executed thereon, sculptured cherubim, palms and flowers; the doors w were carved in olive wood and overlaid with gold plates. The bronze-founder Hiram from Tyre, the son of a widow of the tribe of Napthali, cast for him the two columns Jachin and Boaz, placed before the portico of the Temple, with their richly adorned bronze chapiters. He built his own Palace wi with "cedar" columns; its porticos were constructed of columns and heavy beams. (Kings, V, 6; VI, 10, 15, 16, 18, 21, 29, 32; VII, 6, 9, 15).

What has been deduced for Cyprus and the Asiatic coast eastward thereof, may indeed be assumed also for the coasts of Asia Minor lying north and northwest.

The original wealth of the country in wood was somewhat lessened in time by traffic in logs and lumber, by its use in building ships and structures, and by employment as fuel; mo moreover irrational or defective cutting thinned the forests; cedars, cypresses and sycamores were at command in ever lessening quantity.

These circumstances, combined with the lack of durability of this building material, in time permitted the richly abundant and more resistant stone to become more prominent, at first for structures serving for more important purposes, and in this way the mixed mode of building gave place to one more nearly of stone. Meanwhile wooden columns were set on stone bases, that raised them above the damp pavement and thus protected them from dampness, or they received a protecting coating, before they gave place to stone pillars, to which the

character of the former was transferred in both form and proportions.

The date of the completion of the innovation can scarcely be accurately determined here; how it was completed may be s seen on Lycian and Carian rock-cut tombs. The ancient terrace roof there first gave place to that with rafters or the gable roof; the closely set round trunks were replaced by squared timbers set farther apart; the old wooden pillars yielded to the columns, and the wooden abacus over them, to the volute capital. But these changes were not perfected before Lycia entered into closer relations to Greece, before it was incorporated in the Ionic satrapy (515 B.C.). The inscription on the Tomb of Amyntas is not considered earlier than 400 B.C., and it cannot be assumed to be a later addition.

As repeatedly explained, the tombs represent the habitations of the living, and in accordance with this law, the well built wooden cabin, as slavishly imitated in the rock-cut tombs in even the smallest detail (both in relief as well as if detached), prevailed, and with it wooden construction also. Its structural elements were recognized on the tombs at the same time by Niemann and Dieulafoy (1884) and were technically explained, when they pointed out in the triple series of beams corbelled out at the ends and over the round ceiling beams, the tier for preventing the sliding of the terrace roof, covered with rubbish and straw mixed with clay.

The erroneous ideas of Semper can no longer be held, that the Lycian rock-cut tomb is to be regarded as a monumental funeral pyre, and to which he adhered for a time, in consequence of the preceding statement and of the most recent examinations of these monuments by Benndorf, Niemann, Petersen, von Luschan, as well as the conclusions and comparisons with ancient Persian architecture by Dieulafoy.[1] The temple facades of Lycian tombs cannot therefore be longer regarded as a transition st stage of Ionic stone architecture. Their value to art history "will not be annuleed thereby, scarcely be perceptibly lessened, but rather assured in the chief matter. They remain as proofs of an early phase of the development of the Ionic style, though not as originals, but rather as indirect copies."[2]

Note 1. See Benndorf & Niemann. Reisen in Lykien und Karien. Vienna. 1884. Also Petersen & von Luschan. Reisen in Lykien, Milyas und Kibyratis. Vienna. 1889.

Note 2. See Benndorf. p. 118.

To a preceding mixed stone and wood construction must the perfected stone structures of the Ionic order owe their origin, as explained for the Doric order, with the difference, that in transforming the slender proportions of wooden structural elements, these were also allowed to prevail in stone construction as well. With a change in general, the parts resting on the columns could be retained in their original functions, when the new stone ceiling was also permitted to rest on the architrave and was not raised to the height of the cornice, as in Doric stone construction, its former location being only decoratively indicated still in the frieze. (Fig. 261).

The characteristic peculiarities of the new order are then;- slender columns standing on separate richly moulded bases and accented by vertical semicircular flutes separated from each other by fillets, crowned by the volute capitals as shown, and spaced uniformly and further apart, but set vertically; a plain frieze or one sculptured with figures, without architectural breaks; a simple projecting cornice with deeply undercut water-drip, and which sometimes rests on the well known so-called dentils, the placing of the beams of the portico c ceiling directly on the architrave.

A frequently added criterion, "a wider and lighter architrave, columns farther apart and more slender," is only true in regard to the greater lightness of the former and the slenderness of the latter. On the boldest Ionic temple, that of Apollo Didymeos in Miletus, the columns stand closer between c centres, than at the middle interval of the Doric Propyleion in Athens; the intercolumniation of the heaviest Doric temple in the Peloponnessus, that in Corinth, is equal to that of t the Ionic colonnade in the Athenian Propyleion.(Fig. 262).

As already shown, the earliest knowledge of the countries of Asia Minor and of the adjacent islands extends back to the middle of the second thousand years B. C.; the earliest very simple architectural productions must indeed have been of na-

native origin; these later experienced changes and a higher perfection of form by Phoenician, Assyrian and Egyptian influences and the addition of Grecian elements.

What has come down to us belongs to the period of Alexander or that of the Diadochides, with the exception of the included Lycian and Carian rock-cut tombs. Much likewise originated only under Roman rule. Only on European soil in Attic lands are preserved still for us a number of charming creations from the best period of Hellenic art, although in ruins; in lower Italy and Sicily do we meet with merely scanty remains, some capitals of porous limestone (Locri, Solunto).

Most monuments of this architectural style exhibit the perfected marble style; rarer are limestone buildings with stucco coatings.

The monuments of this style were embellished with the gleam of rich gilding and the splendor of colors, as sufficiently proved by vestiges and by traditions.

Without change or variation of details, the temples occur in all possible dimensions, from the smallest chapel-like Temple of Nike Apteros at Athens to the gigantic structures of Miletus and Ephesus. The same forms were employed at the small as at the large scale, just as was the case in the Doric order likewise.(Fig. 263).

Western Asia was the country in which Semetic and Hellenic civilizations most intimately combined. The information given by the Bible concerning the arrangement of Solomon's Temple must therefore accord in a higher degree with the Asiatic Ionic temples, than with the Hellenic Doric ones previously described.

Finally, if we confirm Braun's axiom, that "the Ionic style belongs to Nineveh, perhaps even to Babylon; for it was already the common style of Asia at an ancient date, not to be computed, -- it is a powerful style, whose envoys may be traced into Asia Minor, along the Phoenician coasts to Carthage, and even into innermost Africa," we may reject the Vitruvian fable of the invention of this style (Book IV, Chap. 1) and his explanations of the volutes as coiled tresses of women's hair and of the flutes as the folds of garments.

The substructure (stylobate) in Attic Ionic monuments

consists of 3 steps, either of plain form as in most Doric s structures, or more richly treated by a recession, as on the little Temple of Nike Apteros in Athens (Fig. 264). We generally find higher substructures in temples in Asia Minor, after models in inner Asia. On the Temple of Magnesia, for example, these were arranged in 5 steps, at Aizani in 7, and on the Artemesion in Ephesus in 10.

Curvatures on the substructures have never yet been determined on Ionic temples. The Athenian are free from such, and only on the Ionic temples on the theatre terrace at Pergamon may such be recognized.

b. The outer walls do not rest directly on the pavement of the portico, but on a continuous richly moulded base, whose section is usually imitated from that of the bases of the columns; they are terminated or crowned at top by a cap, that in part shows the members of the ante capitals.

The walls are not inclined but are strictly vertical and a are built of coursed stones, that exhibit on their beds and ends the same mode of working as the ashlars of Doric monuments, and which are connected together in the same manner by dowells and iron I-cramps.

On the external surface, the height of the coursed ashlars is to their lengths as 1 to 2.7 or 3.

The lowest course is in Athenian buildings higher than the others, just as in Doric (see Parthenon, Theseion, Paestum, and others), and it projects 3/8 inch from the wall surface at the Erectheion. The fillet with the apophyge is there cut on this course (265).

Decoration of the wall surfaces by pilasters in the interior is not excluded, as for example, is shown by the walls of the Temple at Miletus.

The angles are specially accented by small projections, frequently of unequal width on the different sides (see Temple of Nike). The slightly projecting wall ends or antes, described in the Doric style, likewise occur here and are opposite the external or intermediate columns, or they increase to become massive piers, as on the north portico of the Erechheion and on the charming caryatid portico in Athens.

c. Doors and windows exhibit openings of vertical rectang-

rectangular or trapezoidal shape. The sides of the former either consist of plain vertical piers, which like antes are c crowned by capitals and are connected at top by a plain lintel (Fig. 266), as for the doorway of the caryatid portico, or richly moulded jambs and lintel enclose the opening, as at t the doorway of the north portico of the Erectheion. A broad band, decorated by flat rosettes similar to those usually occurring on Assyrian tombs [1], is the principal member of the architrave of the last doorway, and it is recessed toward the opening in moulded ogee bands ornamented by leaves. The rosettes on the bands of the jambs have instead of the low calixes deeply drilled holes, that may have served for fastening a movable ornament. It is singular to find in the midst of the exquisite and marvellously executed sculpture the setting bosses remaining below the round rosette of the left jamb. On the right and left of the lintel project from the wall magnificently wrought volute-consoles, models in design and execution, and they receive the cap, which consists ofcornice, carved lower member (egg-ant-dart-moulding) and the cyma ornamented by anthemions; these parts compose in construction, in form and proportions, one of the most beautiful doorway enclosures of all times.(Fig. 267).

Note 1. See Dieulafoy. Vol. 2. p. 21. Already at Mycenae was the doorway to the recently more carefully explored second "Tholos" similarly enclosed. See Eph.Arch.1891.Pl. 1.

A similar treatment is also found on one of the Ionic Rock-cut facades of tombs in Telmissus; instructive there is the false bronze or wooden door with its architrave, panels, knobs and nails, imitated in stone.

Another rock-cut tomb in Antiphellos shows the architrave of the door with the strongly marked, so-called "ears", with an ogee moulding extending around it and with three bands, a treatment that we meet with again on the windows of the western side of the Erectheion, in simiplified and ennobled form. (See Figs. 261, 266).

It is worthy of note, that in all the cases mentioned, the mouldings are carried down to the base or sill and are not r returned or extended horizontally.

The Ionic monuments of the Alexandrine period, like those originating under Roman rule, all show richly moulded and decorated frameworks with projecting roofs. (See Pergamonwerk. Vol. 4. Pl. 39. Jamb of the Ionic Temple, the Artemesion built about 220-225 B.C., the Temple of Zeus at Magnesia, the Asclepion and the Temple of Demeter at Priene etc.).

From the earlier period, the Treasury of the Cnidians (?) at Delphi gives an interesting example of a richly ornamented doorway enclosure with a roof supported by consoles. These consoles have but one volute and thus are less richly shaped than those of the Erectheion (Fig. 268). Their front surfaces are less elegantly formed; they exhibit the singularly short rounds on the front angles. (Also see the drawing of the corresponding fragments in Perrot & Chipiez,' p. 649).

A doorway with roof on two consoles of indeterminate form is to be found on an Ionic marble relief of an altar of Apollo and the Nymphs on Thasos (now exhibited in the Louvre) -- "belonging to the period of the latest refined products of a archaism."

The window sills of the western facade of the Erectheion are simple and plain, formed in cross section as rectangular sills and furnished with a groove and an opening, to make possible the placing of the closing slab, that was indeed perforated or of thin polished marble, as still to be seen on old Italian churches.(S. Miniato and Orvieto).

Very recently an American, S. P. Stevens, carefully examined the ashlars fallen before the western facade of the Erectheion, by which it was determined, that on the right and left of the main entrance doorway to the cell of Athena were arranged single narrow windows (opening 1 to 3 1/2), which had richly decorated architraves with caps. The sill, from which rose the jamb, was there plain and simple. The architrave, for which small space remained, must have been made of wood or metal, according to the finds. The arrangement recalls that of the entrance hall at the Pinacothek of the Propyleion at Athens. (Fig. 269).

d. The column consists of the base, shaft and capital, and it is not inclined toward the wall of the temple, as in the Doric order, but is set strictly vertical. It is diminished

less than the Doric column, has a scarcely measurable entasis, rising in slender form like its wooden prototype to a height of 8 to 10 times its lower diameter. Including plinth, the lower diameter of the column is to its height as follows:--

Temple of Athena in Priene	1 to 8 1/3.
Propyleion in Priene	1 to 9 1/3.
Temple of Apollo in Miletus	1 to 9 1/5.
Propyleion in Athens	1 to 9 1/6.
Temple of Apollo in Phigaleia	1 to 9 1/2.
Temple of Zeus in Aizani	1 to 10.

The height of the base (exclusive of plinth) is less than or equal to the lower radius of the column; the height of the simple capital (measured from above the volutes) is somewhat more than that radius; if a necking ornamented by anthemions is arranged, as on the Erectheion, then the height of the capital (measured from the top of the abacus to the bottom of astragal) is about 3/4 the lower diameter, or is equal thereto, as on the Temple in Phigaleia.

Twenty-four flutes of semicircular or oval horizontal section, separated from each other by narrow fillets, surround the shaft of the column and terminate in semicircular form at top and bottom, passing into the apophyges.

On the older monuments, the base consists of a slightly concave block of circular form, fluted horizontally or decorated by astragals and scotias, and which rests directly on the uppermost step of the stylobate and supports a torus likewise fluted, from which a small round with fillet and apophyge forms the transition to the shaft of the column (see Samos and Priene). On some temples the torus is left smooth on its upper half, which is not to be taken as a peculiarity in the moulding. The base was merely not fully wrought. To prevent injury to the delicate fillets, working them was postponed until the entire completion of the construction, and it was then frequently omitted in time of need, or even intentionally. The lower half must be completely wrought before setting, since it would have been technically impossible to reach.it afterwards with tools, while the later working of the upper half presented no difficulties. The bases in the Hellenistic per-

period were frequently set on separate square blocks or plinths, as in Aphrodisias, Aizani, Teos and Priene, thus being removed from contact with the stylobate. The French excavations in Miletus have yielded polygonal plinths beneath the bases of the columns, decorated by reliefs.

The bases in the interior of the Temple at Phigaleia are of more expanded form with a strong apophyge, which does not permit the fixing of an early date. A beautifully perfected and refined form is only shown by those of the Attic monuments on the Acropolis at Athens. Without plinths, if the circular socle of the Ionic columns of the Propyleion in Athens be not so considered, they stand directly on the stylobate and are composed of a large torus, fillet, scotia, fillet, a smaller torus with fillet and an apophyge. The toruses are partly formed like a group of small astragals, are fluted like the columns, but here horizontally, or are covered by interwoven ornamentation.

From the simple and clear form, the bases of Hellenistic c columns accordingly vary. The members were no longer appropriately decorated, instead of beaded astragals and the horizontal flutes occur fret and scroll ornaments as well as ascending palm leaves and the like.(Figs. 270 a, b).

The square plinths with angles cut off in octagonal form a are to be regarded technically as an improvement. The angles were not loaded and were easily broken off from the low square plinth, carelessly set.

Shafts and bases of columns for this order were also roughly cut in the quarry, only being finished after setting, as shown by an unfinished drum of a column from the Didymaeon near Miletus.

The capital shows various starting points in its development and treatment. Two types continue beside each other, whose supporters are two principal Grecian races, the Aeolian and the Ionian. Larger works of the former are found in the Aeolic cities of Neandria and on Lesbos; of the latter in the Ionic Ephesus and Samos. The typical forms of capital for both races are the so-called volute capitals. The characteristic difference between them lies in the development and course of

the volutes. In the Ionic, an elongated dressed block is placed above the annular crowning echinus of the shaft, supporting the load of the entablature on the support, its ends exhibiting a termination, as for the architrave of a rock-cut Tomb in Limyra (Fig. 271). The most beautiful and finest motive for the terminal form of a horizontal projecting stone receiving a burden -- or a wooden beam. For the Aeolic capital, the volutes develop from the shaft like a crown of flowers, analagous to the capital of the Egyptian so-called lily column.(Fig. 272, from Tell-Amarna, period of Amenophis VI, (1447 B.C.)).

But the like form is further found on Assyrian tombs, among the Phoenicians, the Hittites, and on Cyprus.(Fig. 273).

With reference to the role played by the "volute" in Grecian art on the Ionic capital, Perrot & Chipiez (I, p. 543) give from the old kingdom of the Egyptians an entablature block with a column, whose capital shows two volutes curved downward, and in IV, 6, p. 645, a similar one from a bas-relief of Jasili-Kaia, taken from a little structure and designated as Hittite work, of that people known in the Bible (Book of Joshua), and that were the western neighbors of the Assyrians, who became acquainted with and adopted the"column"from them. The two forms of capital, consonant in their ground ideas, f from Egypt and from the Hittite land became corrupted in the second half of the second century B.C., in the best period of the descendants of Thutmes and of Ramses. They thus occur in two different countries at the same time, to which Hellas owes its art and civilization.(Figs. 272, 273, 274).

This ancient form only occurred again in the Peleponnessus on the half columns in the interior of the Temple of Phigaleia, that is indeed only correctly represented in the work of Stackelberg, and which agrees with the original piece in the British Museum at London. See Fig. 275, on which it must be said, that besides the single fragment in the Museum mentioned nothing further exists, and that the abacus placed on it in the otherwise fine publication of Cockerell is merely conjectural.

But it should only be stated thereon, that those capitals

of half columns have no claim to high antiquity; for between them and the Egyptian or Hittite prototypes lie 1000 years, if not more. In am in nowise inclined to place the Temple of Phigaleia in the time of Pericles (see my Essay on this in Oestt. Jahreshefften. 1906.); it repeats only the oldest and half unknown forms, in which is not carried out a clear separation between the echinus crowning the shaft and the intermediate block laid thereon.(Also see the bases of the antes on the Temple of Athena at Priene, that was dedicated by Alexander the Great). This unskilfulness is likewise for me no indication of great antiquity. It is avoided on the Ionic columns of the Propyleion of Mnesicles on the Acropolis of Athens.

Definitely expressed is the separation on the ruins of the ancient Temples at Naucratis and on Samos (Fig. 276), as also on the Column of Naxos at Delphi (Fig. 275) and on the capital of a column on Delos or on the ancient Artemesion in Ephesus. (Fig. 276). Here can arise no doubt concerning the duplex division of the capital and on the manner of origin, that has nothing to do with the development of the volutes from the f flower corolla growing out of the stem. The same is taught to us likewise by the capitals of the best end of the Alexandrine period, just as by the capitals with the bent outer co course of the volutes from Locri and Gela.(Fig. 277). Also from the archaic Ionic capital of the Acropolis Museum at Athens (Fig. 278) can no other course of the development be deduced.

The volutes, connected by a bolster, were without an abacus, but are in some cases divided in the middle and are joined by a palmation, as exhibited by the capitals of Delos and of Artemis Euclia at Athens.(Fig. 279). On the Alexandrine capital of the Temple of Cybele at Sardis, the connection at the middle is again omitted, in its place being a rosette with extending scholls.(Fig. 280). Instead of the echinus cap, there is placed on an antique capital a painted cyma with plain headband, and the vacant space between bolster and cap is covered by painted scales.(Original in Athens, Fig. 276). But there now occur further very remarkable diversities in the volutes

themselves. On the ancient Artemesion at Ephesus (560 B.C.) are marked only the outer outlines of the volutes, the surfaces thus enclosed being adorned by great rosettes, so that there can in general be no mention of a development of the volute outwards. The same treatment may also be seen on a small terra cotta capital from Gela, and also on the before mentioned Egyptian volute capital of the old kingdom. But in addition to the great rosette ornaments, there also occurs on the same Temple a course of the spirals about an end point. (Fig. 281). But the most common solution is that with the volute eyes, which are either smooth or hollowed, or they are filled with small inserted rosettes.

From the Hellenistic period likewise date the additions in inner Asia in the form of heads of bulls, that either grow o out sidewise from the bolster or are placed in the middle between the spirals, as shown by the examples in Ephesus, Magnesia-a-M. and Miletus.(Fig.282). At the place last mentioned are inserted medallion heads in place of the spirals.(Fig. 283). The bull heads on the Doric capitals of the Portico of the Bulls on Delos have an interesting analogy, formed by a block found on Cyprus (original in London) with winged bodies of bulls and interposed figure and scrool ornament.(Fig. 282).

The Aeolic-Ionic form is usually designated as the oldest shape. Why is not stated; but it remains certain, that the purely Ionic extended back beyond the middle of the 6 th century (old Artemesion at Ephesus, 560 B.C), and already appeared on great monumental structures, while for the Aeolic not a single peripteral use can be established, neither in Columdado, in Aegea, nor in Neandria. As the original for all may be regarded the capital in Boghas-koi drawn by Puchstein. "They are two flourishing branches of the same stem, of which the Aeolic bloomed and withered earliest." Well said, but the earlier blossoming is still to be proved. Among the fragments of porous limestone architecture in the Acropolis Museum in Athens, both styles have representatives, that must be of similar age: the interesting experimental block with horizontal projecting volutes and the rudely wrought pieces with painted or scratched ascending volutes.(Fig. 284). The arrangement of the divided volutes has likewise found proof there.

"Two flourishing branches" must be accepted; but only the Ionic came to blossom, as a result overweighted the stem and did not allow the Aeolic-Ionic to appear.

In Neandria Clarke and Koldewey labored successively on the Tschigi-Dagh. The latter succeeded in determining the form of the columns supporting the ridge of the roof, where were rows of leaves beneath the aspiring volutes, that accord with the similar forms on the columns of Pessian royal palaces, but where it must not be forgotten, that the Persian hall structures mentioned date from the time of Darius and Xerxes (490 and 480 B.C.), the latter therefore being later and not being prototypes for the Grecian Ionic order.(Fig. 285).

The capital of the perfected Attic-ionic style exhibits in peripteral use the form, which we have seen on the Temple at Priene.(Fig. 284). The shaft of the column is enlarged as below at the base, so likewise above at the capital, and it usually finds its termination in a projecting round with a small fillet beneath (Fig. 288), frequently with a second above it. This astragal in most cases is wrought together with the shaft of the column or with the uppermost drum of the column,[1] and there first rises above this the bolster capital, wrought in a separate block, whose spirals sink toward the middle of the column, this sinking must personify the "springy action of t the curve." The bolster with the volutes rests on a great round, that is ornamented by carved or painted ovate leaves.

Note 1. On a capital from the Temple of Artemis at Pergamon, the capital, astragal and a portion of the fluted shaft are wrought in one block.(Fig. 288).

The bolster is covered by a rectangular moulded abacus with a raised central projection about 0.04 inch high to receive the architrave.(Fig. 287).

In later buildings the beautiful elastic line generally disappears, that connects together the two spirals, giving place to a straight and dry connection. The capitals of the pediment ends and the longer sides exhibit forms precisely similar. The surfaces of the volutes lie in the plane of the face of the architrave.

For a richer development of the capital, as on the Erectheion, there is added a special necking member, that is covered

by ascending anthemion ornament. To the quarter round is then also added a round adorned by plaited work, that is wrought on the capital, while the quarter round remains connected with the necking or the uppermost drum of the column.

But the anthemion on the necking of the capital is likewise apparent on the fragments of the temples in Naukratis, on Samos, and in very recent years on the columns of the Temple in Locri.(Fig. 286; original in the Naples Museum). While on t the Erecthion this is separated from the flutes of the shaft of the column by an astragal, we find in the latter a contraction between flutes and anthemions, since the downward points of the foliage lie in the spandrels of the arches terminating the flutes.(Fig. 286).

The spirals move in delicately curved lines in several coils that cannot be described by compasses. Their outlines are b bordered by an outwardly curved border, single or double (see Propyleion, Erecheion),and their surfaces are correspondingly hollowed out once or twice. In the richly shaped capitals, the turns of the volutes are separated by rectangular grooves or are joined with the spiral borders by delicate rounds.

The vacant triangular space,produced at the points where the spirals separate from the depressed middle portion, is usually concealed by a small palmette ornament, where this is not the case, as on the magnificent capitals of the Erechtheion, bronze nails in the outlines of the volutes indicate that gilded bronze palm leaves were inserted therein.(See colored Plate IV and Fig. 289).

The bolster at the side either retains its plain cut or bell shape, similarly enlarged from the centre toward right and left, or hollows and astragals, smooth or set with beads, ornament it, following the curve of the outer spiral, or merely the centre is masked with an ornament (see Miletus), or the surface of the bolster is covered by scrolls and palm ornaments (see Priene and Sardes), or the bolster is composed of t two acanthus cups united at the middle, from which reed-like leaves extend to the outer spiral margin and border it like lace, as may be seen on a single capital found on the Acropolis of Athens.(Fig. 290).

However perfected the Ionic capital must be termed, when employed between antes or in the line of direction of the architrave, it was just as unsatisfactory at the angle of the peripteral arrangement, where the two architraves are at a right angle.

The external sides of the capital of the angle column parallel to the faces of the architrave only half conform to those of the intermediate normal columns. The volutes extending toward the angle, designed to meet each other at a right angle, are both bent at an angle of 45°, thus in a manner composing a single volute. Thus the drawing and the development of the normal volute are retained. The result must be designated as thoughtful. The side bolster thereby remains entirely normal and requires no change. But it is otherwise with the sides toward the cell and intersecting at right angles. No bending occurs there nor a flexible junction as at the outer sides. One volute says to the other:--"thus far and no farther!", and both lose their unity, their logical development -- at least on the monuments of the best period. The volutes are cut into two parts by a vertical plane through the eye, these abutting against each other in a rude way. Is this the sole and earliest attempt? Certainly not. At the beginning we perceive the Aeolic-Ionic style was probably never employed as peripteral. Or if so, then must its angle columns obey t the same law of development as those of the Attic-Ionic .

The earliest evidence of Attic-Ionic stone capitals of columns remains to us in the votive column of Naxos at Delphi a and the columns of the ancient Artemesion at Ephesus, which in a striking manner show their origin from the wooden cap, preparatory for and making possible the reception of the architrave, there lie over the free supports the narrow connecting pieces of rectangular cross section, projecting far beyond the support. "Their ending in the projection occurs in the only possible form of a spiral, when they with continual reduction of their thickness are firmly wound together or terminate in the scheme of a volute; there a so-called eye marks the c centre of the volute as an axis." Thus Karl Bötticher in his Tektonik der Hellenen (Berdin. 1973. p. 293) -- inspired and true.

This widely projecting cap, that rests on a Doric-like cymatium terminating the cyma and but partially covering this, shows the so-called eye of the volute, not as in the best period lying in the plane tangent to the shaft of the column, but outside this. The further apart are the centres of the eyes of the volutes, so much the more has the capital the appearance of a long extended form, that betrays the ground principle of an innate wooden construction, which disappears t the more, the nearer the centres of the eyes approach each other. On the Erechtheion, on the little Temple on the Ilissus, and on the little building of the wingless goddess of victory (Nike Apteros), on Alexandrine temples etc., they are but little outside this. On the position of the centres of these e eyes depends the formal treatment of the angle capital. This furthermore affords for us conclusions in regard to the relative age of the buildings.

If we attempt the drawing of an angle capital on the basis of the capital of the Column of Naxos, or better of one of the ancient Artemesion at Ephesus, we shall find that likewise for the inner side is possible the full development of the volutes with the same outlines and with like courses of the volutes, as for the exterior. An analogy remains to us in some small Ionic terra cotta columns, that once adorned the interior of a saccophagus in Gela.(Fig. 297). I first saw and drew one of these in London, a second in 1908 in the Arndt's Collection in Munich, and others were furnished to us by the publication of Paolo Orsi,[1] who had found an angle column in an internal angle. Of the greatest value and interest for us, since it supports our conception of the form of an angle capital with widely separated centres of the volutes.(Fig. 297). The hard right angle at which the volutes abut indeed remains, but the volutes themselves remain undisturbed thereby. The approximation of the centres of the eyes brought us a more finely proportioned general form, particularly the front side and the execution in stone, in which the reminiscences of a wooden construction disappeared, but when the combined volutes must be taken in the bargain. But one would scarcely be troubled thereby. The well known publications on the German exca-

excavations then also brought up this question, besides many others. In them with reference to the contributions and reproductions of the sketches of the French investigator Huyot, (p. 94) it was determined, that for the form and decoration of the internal reentrant angle of the Ionic capital of Priene, one is referred to Chandler's view and two sketches of Huyot. These latter teach, "that the connected volutes were completely developed, and that the abacus on the reentrant a angle varied, while the angle at which the two grooves at right angles intersected, in both cases was covered by a palmation springing from a corolla." The conclusion that the abutting volutes were "completely developed," is scarcely to be taken in earnest. The attempt at a graphical representation of what was said would indeed prove the untenability of the principle. The centres of the volutes lie near the shaft of the column.(Figs. 291 a, b). Thomas-Puchstein makes it 2.13 ft. from the centre of the column, Huyot only 1.86, Willberg-Swenson 1.96, while the photograph again makes it something more. For this case it is important, who is right. H Here is only expressed the fact, that the centres of the volutes are near the shaft of the column, and that the outline of the volute passes over the same. This makes the "completely developed" volute on the inside already impossible.

Note 1. Monumenti antichi. Real Accademia dei Lincei. Milan. 1906. Gela, Scavi del 1900 - 1905. Fig. 366 (p. 523) by Paolo Orsi.

The capitals on the Erechtheion, on the two little Temples on the Ilissus and of Nike Apteros on the Acropolis of Athens, exhibit in the reentrant angle half eyes (Figs. 291 a and A) and half developed volutes. Men have since been satisfied w therewith. If Huyot's drawing and its interpretation by the editor of the German publication be accepted, then "complete" volutes would only be possible by proceeding according to Fig. 291 (m or n). In one case is obtained an uncut bolster, and in the other elleptical volutes, that appear to me equally impossible. Both would be tasteless. On the contrary, if the distance between the centres of the volutes was taken somewhat greater, then would two entire eyes be possible, that touch

at one point and would justify the growth of a palmatium between them.(Fig. 291 a). But if one adopts the dimensions of Thomas-Puchstein as sufficient, then the second turns of the volutes touch; the innermost turns and the eyes remain normal, and Huyot's palmatiums would probably be arranged. They would be organically developed from the turns of the volutes, and in their general proportions -- at least for my taste -- would appear well arranged. Their plain reproduction after the sketches of Huyot tells us nothing more, whether we have to do w with a more possible way for this or merely with a suggestion.

W. Lethaby in his "Greek Buildings"(II. Tomb of Mausolus. p. 59, 60. London. 1908). is occupied with the question, whereby according to his Fig. 46, the completeness of the volute on the inner side is abandoned, -- at least for Halicarnassus, -- where the second turns touch each other, but the eyes remain intact.

A. Marquand (Greek Architecture. New York. 1909). embodies Huyot's statements in his Fig. 314 with entire volutes and inserted palmatiums in their absolute impossibility.

It is yet to be stated, that the abutting angle volutes were generally richly decorated at the intersection; with foliage on the Erechtheion, with palmatiums in Priene, a fragment of which is preserved in the Pergamon Museum in Berlin.

What makes the Doric capital so convenient for peripteral use -- the uniform and easy possibility of placing it on any location, without being compelled to change its form-- fails in that developed from the Ionic. Even the Hellenic genius, skilled in form, could create no satisfying result in the treatment of the separate angle capital.

It is still to be noted, that the angle palmatiums of the volutes are not always placed in the triangular space above the cymatium, but frequently fall down on the cymatium.(See the capitals from the ancient and the Alexandrine Artemesion at Ephesus, once with more severe, than with more animated treatment.(Fig. 294).

A rather foreign treatment is shown by the Ionic capitals from Soluntum in the Museum at Palermo, on which instead of the angle palm leaves, tall upright anthemions are arranged

as if intersecting over the bolster. (Fig. 295).

A more convenient peripteral use led to Ionic capitals with volutes on four sides, examples of which are given by Fig. 295. We find them common in Pompeii with polychromatic finish and with the characteristic eggs-and-darts on the low cyma, as if in thin metal. The volutes are then colored light blue on the front surfaces and yellow on the rear side.[1]

Note 1. See Damiani-Almeyda, G. Institutions Architectoniques et ornamentales sur l'Antique et sur la Vraie. Pl. 10. Palermo. 1884.

If the Ionic capital was already characterized by its form and decoration, it still only attained the highest degree of its ornamentation by painting. (See colored Plate IV.).

Vestiges of this have frequently been preserved for us on the Athenian fragments.[2]

Note 2. Compare the corresponding statements concerning p painting in Allg. Bauz. 1881. p. 350.

On ancient Athenian stele capitals are visible green spiral lines, red volute eyes, cymas with red and green leaves, reddish yellow spiral lines on another, bands and palmations colored red and white, on a third being the fret on the abacus green on a red coating, the eyes green and the leaves alternately red and green.

As peculiarities may be still be mentioned:--

The mode of connection of four volutes at the angles in archaic forms, whose origin thus lies somewhat further back, and by which it is shown how men, without the exertion of the distortion of an angle capital of the best period, wandered from the path. The piece was found in Miletus, an allied one from Myus and from the 4 th century B.C. is found in the Berlin Museum.(Fig. 296; altar acroteria).

On a capital from Priene are executed unequal volute turns, four on the left and three turns of the spirals on the right. (Fig. 298). Then on the Ionic Temple on the theatre terrace at Pergamon (215 A. D.; original in Berlin Museum), the Barocco projecting turns of the volutes, like shavings from a plane, not produced better by the Italian and German late Renaissance. (Fig. 299).

As not exactly happy and even ugly are the capitals from the Gymnasium at Pergamon with the decorated pieces above the abacus (original in Berlin), and likewise the elongated side bolster on the pieces of the altar structure itself, ending in the form of half columns, while again a double capital from Clazomenai (original in the Louvre, Paris) exhibits a pretty solution in the connection of the two bolsters.(Fig. 300).

As a splendid variety of the Ionic order occurs the "columna caelata", in which the shaft of the column was adorned by sculptures -- one of the most splended forms of this style. This motive was already found on the ancient Artemesion at E Ephesus, the only temple spared by Xerxes, and that was still standing at the birth of Alexander the Great. From a heavy torus rose the stumpy fluted shaft of the column, whose lower third was covered by standing figures in relief, and it was crowned at top by the strongly projecting volute capital shown.(Fig. 301). The archaic figures indicate Assyrian prototypes.

A restoration of this ancient Temple on the basis of the remains found was attempted by David George Hogarth. M.A.(The Archaic Artemisia. London. 1908. British Museum Excavations at Ephesus). With the scarcity of the materials, this is pr problematical as for many other temples.

Bases, pedestal figures, capitals and cyma fragments are exhibited in the British Museum at London. The capitals measure 9.51 ft. between external angles, the diameter of the columns is about 3.94 ft., the flat faced cyma adorned by small figures and lions' heads is 2.95 ft. high. So much was accessible to me. What Deinocrates made of it after the fire is shown by the remains discovered by Wood (now likewise collected and exhibited in the British Museum at London). The Alexandrine master has added thereto the cubical pedestals on the pediment facade, also decorated by figures, between which formerly lay the entrance steps. In any case a magnificent facade of the first rank, such as antiquity can scarcely again exhibit! The parts and their sequence were indeed retained, but what has the Alexandrine artist with his eminent abilities made of them?

Fig. 301 shows the sculptured decoration with the signature of king Croesus, beside the Alexandrine.(Fig. 303). And Fig. 304 gives the pedestal with the base of the column thereon. Fig. 302 is determinative for the capital of the new temple, elegant and graceful in coparison with that of the ancient sanctuary.

Likewise iddeed from the Alexandrine or a somewhat earlier period dates the marble throne support (Fig. 209), now exhibited in the Palermo Museum, which repeats the beautiful motive of figures placed around the stem of the support.

Under Roman influence indeed is the Ionic capital form from the Theatre at Laodicea (Dilettanti, Chap. 7, Pl. 50, German edition), of the time between Vespasian and Trajan, about 90 A.D., and two capitals of columns in the oposthodome of the Ionic Temple at Aizani, that according to recent epigraphic studies must belong to the classistic directed period of Hadrian -- thus after 117 A.D. But it is not impossible for t the inscription to be later than the work. What would speak more urgently for a later date is the fact, that two capitals from Aizani [1] recall the Roman Coposite capital, which is first found in 70 A.D. on the Arch of Titus in Rome. Accordingly the capital in Laodicea is still uncertain.

Note 1. In the pronaos.

Then is further the subdivision of the cell walls and the accenting of the end and bed joints, which cannot be proved for the Grecian temple.

For the cell walls of Ionic temples of the best period were also mentioned the antes and their triple subdivision in general. There may be further added in details:--

The antes and wall piers corresponding to the columns have a form of capital different from that of the columns, as in the Doric order. Their volute motive is not transferred to the latter, for it would have been senseless. Egg-and-dart moulding, heart leaves, beads and disks, richly ornamented c cymas and astragals compose a beautifully developed crowning of the antes, that rise vertically without diminution and rest below on a base paneled similarly to those of the columns. -- Interesting are the angle solutions of the leaf adorned myma bands, both on the antes as well as on the volute capitals.

What care in execution was employed on the least detail is shown by this leaf ornament. Frequently concealed and employed at a considrable height on the building, still the details are executed with the same love and like care, as if they were placed just before the eyes of the observer; nowhere appears haste in the modeling. With fine feeling and graduated in relief are the different parts of the leaves, and just as unusually beautiful are the tenderly recurved outilnes of the ovate and lanceolate leaves; just as thoughtful and beautifully arranged is also the foliage at the reentrant angle of the abacus on the angle volute capital.(Figs. 293, 305). And with all this minute execution and surpassing development of the smallest details, the care for the effect of the entirety in general was not disturbed!

These simple and finely graduated ornaments of the early period gave place to a heavy ornamentation on the buildings of Alexander the Great, that is not even symmetrically arranged, and exhibits fillets on one side and scroll ornaments on the other, which have nothing to do with each other organically, (Fig. 307) -- but the former remains characteristic for the Alexandrine-Ionic architecture in Asia Minor.

Besides the columns there also occur square piers as free supports. They are determined at the Propyleion of the Eastern Hall in Magnesia-a-M (see the official Berlin publication. 1904, p. 129), as singly detached and as coupled supports with four developed faces of the capitals.(Fig. 123 in the same). While here band-like divisions of the walls are proved in the Western Hall of the Agora, neither square piers nor wall bands could be determined in Priene by the German investigators (1904), even if they were difinitely given in the works of the Dilettanti.(1829). Even the plan of the Propyleion with 2 × 3 = 6 square piers was gone, thus the editor of the work mentioned being reproached, because in the year 1829 he did not regard everything, that was first made known to a wider circle in 1904.

The capital of a wall pilaster from Miletus (Figs. 308 a, b) on the contrary received grace, since it actually existed in accordance with the reproduction in the Dilettanti.

Similar capitals with such delicate scrolls and tenderly developed bolsters, that were found in Priene and Magnesia-a.M, are stele capitals (Fig. 309), and they formerly bore on their upper surfaces the foot marks of bronze figures; accordingly they may have served as tall supports of consecrated gifts.

Allied to these are the capitals designated as the ends of the backs of benches in horseshoe form, whose originals are in Berlin and London.(Fig. 309).

Among the Ephesian fragments of marble in the British Museum is prominent an ante capital of extremely artistic execution, that exhibits defferently ornamented bands in triple sequence. The middle one of these shows alternating lotus flowers and recurved palmations growing from scrolls, where the surfaces are wrought as perforated by the lotus calyxes. (Fig. 310). Labeled as follows in the Museum mentioned.

No. 1287. Capital of Pilaster.(4 th century B.C.). The moulding subsequently get down.(?). Remains of egg-moulding at top, then lotus and palmettes leaf and art and bead moulding. Ephesus. (Evidently incorrectly copied).

But as a consolation were yet found in Priene (p. 132 of same) two Corinthian pier capitals in the immediate vicinity of the Propyleion:-- "that these belonged to the Propyleion is highly probable from the place where found; where they were placed is scarcely now to be determined." Thus the architects of the Dilettanti must still have had a glimmering.

A third kind of detached support is the human figures supporting an architrave. We have already become acquainted with them attached to the wall of the cell of the mightiest Doric monument, the Temple of Zeus in Akragas; as gigantic atlantes or telamones, they supported with arms thrown back the entablature of the middle aisle. Detached from the space-enclosing walls and bearing the architrave and cornice of a graceful portico, we again meet with them as isolated maidens in the Ionic style of architecture.

These maidens (called caryatids) stand quietly and strongly on square plinths without especial animation in expression a and attitude, the resting leg bent but slightly, the arms held close to the body, with carefully plaited hair and hanging p

plaited tresses, a cushion on the head, from which rises a cap imitated from the Doric capital.

Four such figures stand along the front of the caryatid portico at Athens in pairs similar in attitude and movement, symmetrically arranged about the axis of the building, the supporting leg on the outside with the folds of the coverings falling straight down, the leg at rest being on the side next the middle of the structure. (Fig. 311).

If the figures are actually supports, then in accordance with the thinner and more elegant supports (they break easily at the weaker necking, as shown by the figures on the Erechtheion), the entablature is made lighter. Hence for example, the frieze is wanting on the building mentioned; instead of it, the upper band of the architrave is ornamented by rosettes in order to produce a richer effect or to compensate in some degree for the impoverishment of the entablature, due to the omission of the frieze. The internal supporting beams elsewhere corresponding to the frieze are omitted; the room is ceiled in the simplest manner by slabs with coffers. Dieulafoy recognizes in the arrangement of the entablature the direct transference of the ancient Persian terraced roof cornice into stone.

These perfectly beautiful female figures of the best period are preceded by others, serving for the same purpose on the Treasury of the Cnidians at Delphi, -- archaic in expression and pose.(Figs. 312, 313). Instead of the compressed Doric head cushions employed at the Pandroseion, the figures stand on separate pedestals and bear a tolerably high cylinder adorned by reliefs and with a border of leaves, on which rests the load of the entablature, and that of the pediment.

The motive seems to have been a favorite one, to conclude from its use in vase painting.

In hall 19 (No. 1477, Lucania-Anzi-Pesto) of the Naples Museum is represented on a vase with black ground with red figures, a propyleion (?) about 8 ins. high, that exhibits white caryatids on pedestals decorated by foliage, that support an entablature with pediment.

With great sculptural charm are the three dancing women fo

found in Delphi, that stood on a high base like a candelabrum, and according to the suppositions of the French archaeologists, must have once supported a metal tripod. On the whole a show piece 32.8 ft. high! (Fig. 314).

At the Artemesion in Magnesia-a-M are mentioned enclosures between the Ionic columns, as well as cornice and frieze of the side enclosures of the opisthodome.(Figs. 74, 75, 76, 77, 78 of the German publication. Berlin. 1904.

From the columns rose the entablature in two or three divisions, consisting of architrave, frieze and main cornice. The former existence of a frieze on some temples of the Ionic order is further doubted without compulsory reason. Figs. 315 and 316 exhibit for comparison a possible preceding wooden architecture, that may have influenced the later stone construction of the entablature. The same elements reappear in both modes of construction, yet the frieze is wanting in the wooden arrangement, but on the contrary the height of the portico ceiling is retained in the stone construction. A stone capital of the wooden form shown was found in Delos, a form that Chipiez earlier termed an impossibility.(p. 270. Paris. 1876).

Very recently George Kawerau (Athen-Mitth. 1908) has again advocated the derivation of the stone capital with horizontal projecting volutes from the wooden architectural style, on the ground of some fragments exhibited in the Acropolis Museum at Athens.

The architraves are indeed bold in regard to the slender columns, but are yet lighter than those of the Doric order, Instead of the taenia with the suspended regulas and drops, they receive a continuous crowning moulding, often richly ornamented; its vertical surface is divided into two or three fascias and is generally subdivided alike, both internally and externally. The separate fascias may have once possesed painted ornaments, but vestiges of these are no longer visible. On the smaller monuments, they are cut from a single block of stone in width; in temples of important dimensions, where the diameters of the columns are increased to 6.56 ft. or more, they are made of two stone beams in width, as for example in Magnesia.

Remains in Priene show the inner vertical surface of the architrave less in depth than the outer one, and the under surface is decorated by a sunken panel, bordered by a pearl bead and heart leaves. (Fig. 317).

The height of the architrave is usually equal to the upper diameter of the column; it is frequently higher on the earlier temples and also somewhat lower on the later ones. Thus for example, the architrave is higher on the little Temple of Nike Apteros, is equal on the Erechtheion, and is lower on the Temples in Priene and Miletus, than the upper diameter of the column.

As shown for Doric monuments, the contact of the bearing surfaces is only on narrow cut borders. The architrave, cut from a single block, joins at considerably less than 45° for a space inside, then continues at right angles to the exterior. They still have in this order the purpose of bearing the portico ceiling, that rests directly on them, which may again denote a preceding wooden construction.

f. The Frieze (zoophoros, figure bearer, thrinkos, etc.) is required by Vitruvius to be about a quarter less than the architrave, "but if reliefs are to be executed thereon, about a quarter higher, so that the sculptures may be more prominent." For the plain and moreover not established friezes of the buildings in Priene given by the Dilettanti, the rule of Vitruvius approximately agrees; the friezes are there 1/4 and 2/5 lower than the architrave. But the friezes of the little Temple of Nike Apteros and of the Erechtheion are adorned by figures and are likewise lower than the corresponding architraves, indeed about 1/12; therefore the rule does not fit them.

The small figures of the frieze are either carved on the slab, thus being of the same piece with it, or they are wrought separately and attached, as on the Erechtheion, while the frieze slabs are of darker Eleusinian marble, and the figures are made of Parian marble, and were fixed by iron pins.

The effect was further heightened by color. There is naturally no mention of the influence of the frieze on the spacing of the columns in its development.

The frieze, as an implicit and structurally indispensable portion of the Ionic entablature, is neither in wooden nor in stone construction especially required for the reception of weak and closely set ceiling beams.

At the ancient Artemesion at Ephesus, S. Hogarth (London, 1908) properly assumes in his work thereon a triply divided architrave over the stumpy columns, adds a round and places on this the cornice with the crowning cyma. Likewise the tomb facades in Antiphellos and other places exhibit no friezes. (Fig. 261).

A. Choisy (Histoire de l'Architecture. I. Paris) is therefore right, when he says that frieze and dentils are voluntary additions; the only material difference being the presence or absence of one or the other on the Ionic cornice. From the house onwards the frieze is intended to bear figures, and the plain frieze predominates only in the epoch of Priene-Miletus. Dentils chiefly occur in Athens only on the Pandroseion, but are almost always found in Asia. On the archaic Ionic Treasury of the Cnidians at Delphi(second half of the 6 th century B.C.), the complete severely arranged figure frieze exists between architrave and crowning cornice, and it is now exhibited in the Museum at Delphi. Likewise is ensured by actual existence on the Erechtheion on the Acropolis of Athens the frieze bearing sculptures, that on account of the reasons already given was omitted on the caryatid portico of the building mentioned, for which the dentils are then taken.

The Dilettanti published (1829) in their work the ground plans and elevations of the Ionic Temple of Athena Polias at Priene, giving a plain frieze to it. But objections to this were not made until a few years since (1904). The date of the erection of the Temple is fixed by a dedicatory inscription of Alexander the Great.(Between 336 and 323 B.C.). Thus about 80 years later than the completion of the Erechtheion. Nevertheless the Ionic Temple mentioned is preferably taken as the starting point of the Ionic style of architecture in western Asia, and also of the Artemesion at Magnesia-a-M, about 100 years later, it is quietly printed, "that it was of wide importance for the development of Hellenistic architecture."

The Hellenistic Artemesion at Ephesus, that was completed by one of the generals of Alexander, even before one thought of the transformation of the Artemesion in Magnesia, did it indeed play no part?

Yet two Ionic monuments of the time from 370 to 350 B.C. must be included here, the so-called Nereid Monument at Xanthos in Lycia and the Tomb of Mausolus at Halicarnassos. At the former we have to do with an "architrave" 1.64 ft. high decorated by figures and resting directly on the Ionic columns -- not a frieze -- with a lower fillet and upper crowning egg-and-dart moulding, over which is the dentil band with the undercut cornice slab, thus with an entablature divided into but two parts. Against the mode of exhibiting the marble remains in the British Museum in London by Falkener and Fellows, no objections have been made, according to my recollection. (See the small Guides to the British Museum; the Nereid Monument and the Mausoleum and sculptures of Halicarnassos and of Priene. London. 1900). On the contrary, the mode of erecting the remains of the Mausoleum at Halicarnassos in the British Museum in London is not everywhere accepted. The arrangement of the figure frieze above the architrave supported by the columns is doubted.(Fig. 316). I may not criticize its location, for the frieze cannot here be omitted with reference to the remaining architecture. In the German publication on Priene, it is stated concerning the frieze of the Temple of Athena Polias, "that no piece was to be found on the site, which must necessarily have come from the frieze," and hence the remarkable conclusion was deduced; "and in fact the Temple never possessed a frieze, but directly on the architrave crowned by a cyma with ovate forms lay the boldly projecting dentils, after the analogy of the entablature on the Leonidaion in Olympia (4 th century B.C.), and on the peripteral portico of the Altar of Zeus at Pergamon." This proof is not exactly absolute. The proposed limitation of the entablature in Priene to architrave and corona of the corresponding structure appears to me personally from a purely artistic point of view too heavy and on the whole inharmonious with the not very slender proportions of the columns, and to the high bases still

set on square plinths. The long line above the columns is t thin and dry, loads and supports are not intended for each other. By the laying up of the original blocks of the entablature in the Pergamon Museum [1] at Berlin, the finely membered corona with the dentils appears too directly placed on the stumpy and triply subdivided architrave.

Note 1. The Pergamon Museum in Berlin has meanwhile disappeared as a building, after it had done good service for seven years.

The Alexandrine artists still understood how to derive a sound application from the traditional, and should it be denied here? Place then the two facades beside each other, that as given by the Dilettanti and the German solution, and I ask to which of them belongs the prize?

The Artemesion at Magnesia-a-M, built by Hermogenes and dedicated in 206 B.C., and the slightly older Temple of Zeus, b both had friezes. A plain frieze is also proved for the Propyleion, and one decorated by ox-skulls and garlands on the great altar of burnt offering there. And how beautiful in e effect in the former Pergamon Museum in Berlin was the logically restored great entablature block (see the official publication on Magnesia-a-M., Pl. 5. Berlin. 1904) with the bold architrave, the graceful frieze adorned by little figures and the splendid main cornice! Must one in Priene have abandoned the traditional grounds, that Hermogenes in Magnesia had not lost? As so without taste, I do not now hold the ancient masters of Briene. And secular structures in Olympia can scarcely be alleged as analogies, when it concerns the work of grand art. The architect of the owner of the inn in Olympia could allow much, that the temple architecture in Priene was not p permitted.

I reverse the saying "Quod licet bovi, non licet Jovi!" (What is permitted to the ox is not permitted to Jupiter). Y Yet this also is a matter of taste!

A frieze with dancing female figures (now in the Louvre) is likewise assured on the ancient Temple in Samothrace, whose cornice bore dentils, likewise on the Philippeon at Olympia. This building also did not lack the frieze.

A frieze decorated by pipes (vertical hollowed leaves) remains on the Ionic Temple in Aizani, that bears above the dentils a console band, and now was corrupted in the time of Hadrian, as stated.

g. The crowning cornice on most Attic monuments consists of a bold and moderately projecting inclined slab crowned by an echinus moulding and deeply undercut beneath, concealing an ogee with pearl bead, which passes into the surface of the frieze.(Fig. 318 A).

The front surface of the cornice is usually inclined somewhat outwards, so that the lowest point lies nearer the plane of the frieze than the upper one, an arrangement likewise found in the covering bands of the small Doric members, as for example, on the abacus of the column and ante capitals a and on the front surface of the cornice slab.

Vitruvius requires for Ionic columnar structures:-- "All members above capitals of columns, especially the architrave, frieze, cornice, tympanum, pediment and acroterias, must have their faces inclined outwards about one-twelfth their height, because if we stand before them and two lines are drawn from the eye, one touching the lowest and the other the highest part of the building, the latter one to the upper part is longest, Thus the more the line of sight to the upper part is elongated, the more this gives to it an appearance as if inclined backwards. But if the members of the facade are inclined forward in the manner just prescribed, they will appear vertical when viewed, and according to the measure of the angle"(III, 5, 13). The fascias of the architrave are also actually inclined forward, as well as the front surface of the cornice slab; I cannot answer for the forward inclination of the other structural parts mentioned by Vitruvius, which are unfortunately no longer in place on any Ionic monument, or even no longer exist.

What an appearance, for example, would the pediment in Miletus have made, if with a height of about 19.68 ft., it had overhung about 1.64 ft.? The refined feeling and eyes of the Greeks must have once required in Doric buildings a pyramidal diminution of all parts of a temple for well understood opti-

optical reasons, while for the frequently contemporary Ionic buildings, often standing in the immediate vicinity of Doric monuments, the opposite was prescribed.

Of what use is all the good researches on optical deceptions and the rules deduced therefrom, in the presence of such opposed facts! In the Ionic style everything is practically rejected, which in the Doric is prescribed as the highest perfection, as the most refined observance of all means for deceiving the eye! We here have the consistently carried out backward inclination of the columns, walls and architrave, frieze and the pediment, there the exactly vertical position of columns and walls, the forward inclination of the front surfaces of the architrave and cornice.

Vitruvius requires a forward inclination, so that the parts of the building may appear vertical to the observer; we generally prescribe a backward inclination, in order that the vertica may not seem to overhang! The measurements are further small in this case, as for example:--

Overhang of fascias on architrave of Erechtheion = 1/27 in.
Overhang of face of cornice there = 1 5/16 in .

For Doric members.

Overhang of abacus of ante on Parthenon = 1 7/8 in.
Overhang of cornice over cell wall and frieze = 2 5/8 in.
Overhang of face of main cornice of Propyleion= 3 ins.
Overhang of face of cornice on Pinacothek = 2 1/4 ins.
Overhang of abacus of capital on the same = 1 1/2 ins.

The overhang of these members may frequently be ascribed to the fact, that they received ornamentation, and that this was better presented to the eye in this way. But this application of ornament is not always the case; others are so high from the ground, or one is compelled to view them from so near a point of sight (as for example, the cornice placed over the frieze of the Parthenon), that such a slight forward inclination of those parts must remain without special effect.

But the simple undercut cornice gives place to a richer treatment of the main cornice, especially in monuments in Asia Minor, where the so-called dentils are inserted between it a and the frieze. We find them employed on Attic buildings, o

only on the caryatid portico and the Tower of the Winds in Athens. They vividly recall a motive borrowed from wooden construction, the projecting small ceiling beams, that were first cut in stone on the rock-cut tombs in Lycia.

On a monument in Priene, they project from a vertical surface and thus appear as if suspended, while on other monuments, like the caryatid portico, they more properly and elegantly seem to rest on the lower projecting member and then express the function of support. We likewise find the dentils at the angle of the building arranged in accordance with this idea. (Fig. 320 b). We find indeed on some buildings that the angles are left solid, which may result from the not quite perfect completion of this portion of the cornice. The projecting angle appears to have been cut only after the setting of the cornice.

The dentils are usually crowned by a kind of head band, recalling a piece laid on the ceiling beams, upon which directly rested the undercut cornice slab.

According to the measurements and publications of S. Pontremoli and B. Haussoullier (Paris. 1904), a wild love of ornamentation overloaded the architectural members of the monumental buildings of the late period. The architects sought to excel themselves therein, but which should occur only within the given esthetic rules. Increasing the sculptures and monstrosities in scale were the only possible means of arousing attention.

The white marble pseudodipteral Temple at Miletus by Hermogenes I may designate as the highest attainable limit in this direction, where were joined to the bull heads and medallions on the capitals also the frieze covered by masks and scroll ornaments and the sunken leaves on the faces of the dentil b blocks (Fig. 320 a). Men desired to offer much and still perfected nothing. A general view of the entablature with the starting block of a pediment is given by Fig. 319, corresponding to the Erechtheion in Athens, while Fig. 321 may afford an idea of the partly restored little Temple of Nike Apteros-- the wingless goddess of victory -- on the southwest point of the Acropolis of Athens, at which the form blindness of the

observer is not counted upon. Both temples desire correct proportions and the possibility of the recognition of forms and not a jolt to harmony!

h. Pediment and pediment cornices. The ends of the temple were crowned by low pediments, that were in part adorned by groups of figures, as in the Doric order, but also had medallions and windows or were left without any decoration.

The monuments afford for these relatively few starting points; yet we know from Pausanias, that the externally Ionic Temple of Athena Alea in Tegea,[1] built by Scopas, possessed sculptures in the pediments -- the Calydonian Hunt being represented in one and the Combat of Telephos with Achilles in the other.

Note 1. Adler believes, "that the external architecture was kept within the Doric scheme", and that only the cell possessed "the Ionic version." (See Cent. d. Bauw. 1882. p. 98). He may indeed be right.

The pediment was covered by a main cornice similar to that of the horizontal entablature, if the latter were without dentils. But if these existed, they were omitted on the pediment cornice, like the mutules on the Doric order.[1]

Note 1. Yet no rule is without exception; different buildings of the late period in Asia Minor, likewise the pediment of the entrance portal on the Tower of Winds at Athens, exhibit dentils sometimes absolutely vertical, sometimes perpendicular to the line of the pediment.

Both the horizontal and the pediment cornices are crowned by an ogee moulding, the cyma, which was decorated by vertical anthemion ornaments and by lions' heads along the sides. (Fig. 319).

The cyma on the caryatid portico consists of a continuous quarter round ornamented by egg-shaped leaves, as on the Propyleion, and terminated abowe by a small ogee moulding with leaves.

The angles and apex of the pediment were also crowned by ornamental acroterias or small figures, as on Doric temples. (See the Nereid Monument at Xanthos, the angles of the Ionic Temple at Pergamon, and the Treasurn of the Cnidians at Delphi.

i. The roof construction and roof covering were generally the same as previously described.

On the Treasury of the Cnidians at Delphi, besides the figure frieze, there also remains the tympanum decorated by figures, with also the ornamentation of the underside of the cornice, the acroterias at the ends and the apex. The complete representation of an archaic temple facade in its unfinished decoration is here assumed. No poetry, but everything is the plain truth! (Figs. 312, 322). The smallness of the pediment figures (height of the apex of the pediment is only 2.30 ft.) compelled a peculiar technical execution of the pediment group. Detached figures of such small size appeared scarcely appropriate, representations in relief were too ineffective-- hence it c.me to a compromise. The legs of the figures were only wrought in releief in the stone mass before the tympanum, and only from the seat upwards were the free figures developed. (Fig. 322). The polychromy must indeed have concealed the irregularity of the cutting of the sculptures in the tympanum.

Of formally and imposingly developed angle and middle acroterias are especially to be mentioned those from the Artemesion at Magnesia, about 9.18 ft. high in general with winged female forms, about which clung scroll work. Numerous fragments of these are found in the Pergamon Museum in Berlin, a and a larger fragment lies on the site of the ruins. Objects from the Hellenistic period form the acroteria of the chief Temple on Samothrace, and the acroterias of the buildings at Pergamon from the period of Roman rule, among which the most beautiful are those of the Trajaneum.(Fig. 323).

If the roof gutter (cyma) of the archaic Artemesion at Ephesus was still flat-faced, adorned by skilfully wrought little figures (height of the cyma = 2.95 ft.), between which and w without any connection were placed great colored lions' heads as water-spouts, then that of the Alexandrine exhibits an ogee form of less height (about 1.87 ft.), whose front surface was likewise beset with lions' heads spouting water, between which was arranged scroll work in strong relief, a treatment that remains characteristic of the entire further period.(Figs. 324 a, b). This is also expressed in the gutter from Magnesia-

-a-M., found in the Louvre, represented in the Prussian publication, p. 65.

The undesside of the cornice (geison) must be assumed on archaic buildings, after the precedent of the Treasury of the Cnidians at Delphi as well as on other buildings, to be covered with ornament. The early Ionic art proceeded there in like manner as the early Doric, where on the poros statues in Athens, flying birds and lotus flowers were incised and painted on the underside of the pediment cornices.

The Nereid Monument in Xanthos and the Treasury of the Cnidians at Delphi are tangible evidence of the figure decoration in the pediment; but evidence therefor is refused by most western monuments, and likewise in Asia Minor. The tympanum remains vacant, or medallions and window openings of different sizes must be accepted as the ornamentation, which in the last instance has the prosaic problem of admitting light and air to the floor, like the three pediment windows in Magnesia-a-M. (Fig. 325, after the Prussian publication. p. 47).

The detail of the formal treatment of the ceiling of the peripteral portico first depended on the material -- whether wood or stone. The absence or presence of a frieze on the entablature had no influence thereon. Constructed of wood, they could be assumed to be flat frame and panel ceilings, in the sense of the arly Italian Renaissance, or strongly profiled coffers gave their energetic effect of light and shade. The former construction is shown by the Prussian publication on Magnesia-a-M., on which assumption Fig. 150 was also executed by me.

Were stone chosen as the material of the ceiling, then would larger or smaller coffered construction be made of corresponding slabs or ashlars, as shown by Fig. 149, after the restoration and the finds at Priene. Under the assumption of the absence of the frieze was the companion cut represented according to the finds and the detail given accurately.

We saw it constructed of slabs and with sunken coffers and resting on architrave beams at the Erechtheion, gleaming with broght color decoration with the addition of metallic ornament, the mouldings decorated by leaves and beads with similarly

moulded coffered slabs, at the same time forming the roof at the Pandroseion, and made the joined slabs with false beams on the Neried Monument in Xanthos.

Most circular buildings (tholos) are in a mixed style. Even some longitudinal structures form an exception from the rule and show in the interior an order different from that on the exterior. Their arrangement in the style order as a rule is according to the external auunlar portico. In this sense is first to be mentioned only the Philippeion in Olympia, whose circle of columns was of the Ionic order, and whose cornices bore dentils, its cell walls being decorated on the inside by Corinthian half columns, according to the description of the finds and Dr. Adler's restoration in the great German work on Olympia. As for the construction of the roof and the interior, both are made probable, but are not certain in all parts. I say this here not as blame, but only for posterity, not to awaken belief and a false conception, as all was once. By the further publication of doubtful coins, more than sufficient error has been produced in the domain of research in the history of architecture. This warns one to exert the most extreme care.

As a purely Ionic circular building is only to be mentioned the monopteral structure on the Acropolis in Athens -- the Sanctuary of Rome and Augustus without a cell, whose columns are imitated from those of the Erechtheion and bear a plain frieze and a cornice without dentils.(See Antike Denkmaler). No stone of the building is left on another, as it only remains in fragments. No restoration of it is therefore certain in all points.

The Tholos in Epidauros had an external circular Doric portico with a Corinthian colonnade in the interior of the cell. Both are certain in their parts. How the building was covered is not determined. Some assume the structure beneath a stepped, others under a n unbroken roof, while yet others leave the cell under the open sky. The first would be best artistically. -- The Tholos in Delphi, according to the evidence, had likewise an external circular Doric portico and a Doric entablature. The internal side of the cell wall was decorated

by Corinthian half columns, judging from the finds now in the Museum at Delphi, just as at the Philippeion at Olympia. (See my Essay in the Jahr. d. Oest. Inst. 1906.). The conical roof of the building was covered by marble tiles, as proved by the finds now in the Museum at Delphi.

Externally Doric, but subdivided in the interior by Corinthian half columns, was also the Arsinoeion on Samothrace.

To the second category -- mixture of styles with rectangular cell -- belonged the Temple at Tegea according to the statement of Pausanias. It must have had an external circular Doric portico, in the interior being adorned by an Ionic colonnade with Corinthian columns in the vestibule. How the Ionic columns were arranged it is now hard to say. There might have been two series of small columns above each other, as for example, at the Doric Temple at Paestum, but a procedure may also have been choses as for the Temple in Phigaleia; continuous half columns or even free columns detached from the wall and extendinm froc floor to ceiling, which bore the architrave, the fireze adorned by figures and a covering cornice without dentils. Remains of those parts are certain (a fragment of a capital and the frieze in the British Museum at London), but not confirmed in details, as they are presented in the monographs of Cockerell and of Stackelberg. The abacus of t the Ionic capital is doubtful and also not very probable; how the side volutes end against the wall pier is not known. Certain is only the mode of the connection of the half columns with the wall piers and the peculiar bosses.(Figs. 326, 327). The Corinthian capital has disappeared.

Another reference to the Ionic colonnade in the interior of the Doric Propyleion at Athens cannot be omitted here.

If in general Springer-Michaelis says (1907, p. 131), "but pure Dorism prevails elsewhere in Greece," this is indeed a fault of memory.

Combinations of the Doric and Ionic motives -- dentils with triglyphs -- are to be noted everywhere on the Alexandrine b buildings in Asia Minor.(Examples on the main cornice of the north portico of the Market in Priene etc.

C. Corinthian Order. -- The Corinthian order does not oc-

occur with entirely individual forms, like the Doric and Ionic; it is rather based on the styles that earlier attained ripeness and perfection. But "it is likewise very primeval and prehistoric in its characteristics." [1] The greatest characteristic, the column with the corolla or bell capital was already found in Thebes on the magnificent structures of the 19 th dynasty (1447-1273 B.C.); but we likewise find it on the sculptures at Nineveh and on the Grecian mainland; in the early period in the Temple of Apollo at Phigaleia, in the interiors of the Tholos at Epidauros and of the Tholos at Delphi.

Note 1. See Semper, Braun and Reber.

Vitruvius states that the capital was invented by the sculptor Callimachus [2], and he relates the well known myth of the nurse, that placed a basket of flowers covered by a stone slab on the grave of her young mistress in Corinth, which was then enclosed by a sprouting acanthus plant, and thus it furnished to the passing Callimachus the motive for the new form of capital. He then made the Corinthian column after this model, which fixed the harmonious proportions and the principles of the erecting structures of the Corinthian order. [3]

Note 2. Probably from Athens; lived about the 93 d. Olympiad.(464 B.C.).

Note 3. See Vitruvius. Book IV. 9. 10.

In the fourth Book, he further states, that the Corinthian order itself has no special rules for the cornice and the other decorations, "but either employs modillions on the main c cornice from the arrangement of the triglyph members with drops on the entablature after the Doric style, or a frieze with d dentils, adorned by reliefs, and a cornice according to Ionic principles."

Thus from the two orders, to which was added a new capital, a third order was created for the style.

But this novelty in form did not merely consist in the arrangement of the cornice, nor in the use of the Egyptian bell capital, and which in the later period was to supplant the other orders, but in the elastically poised frieze, that according to Semper, is treated "as a gently poised wave, which elastically receives the load of the frame of the ceiling and

transmits it to the architrave."

In accordance with what has been said, the marks of the appearance and acceptance of the new style are found in those monuments, on which the different orders occur together, in the interiors of the Temples at Phigaleia and at Miletus, the Tholos at Epidauros and the Philippeion in Olympia, the Arsinoeion on Samothrace, the Temple of Athena Alea in Tegea and the Tholes in Delphi, but only in the period of Alexander did it find general acceptance and become the prevailing order; after the complete destruction of the independence of the Grecian states and people, it was fostered and cultivated by their splendor-loving masters.

The remains of this order left to us are scanty, both on Hellenic (European) and likewise on Asiatic soil; but precious evidence of this most sumptious architectural style are preserved for us in the graceful Choragic Monument of Lysicrates in Athens and in the Temple of Olympian Zeus, located on a high terrace in the lower city of Athens, a monument that in magnitude and splendor, in beauty and massiveness of materials, seeks its equal in all ages, and whose construction continued for six and a half centuries (it was finished 650 years after the laying of the foundation stone), although with interruptions, from the Pisastratides until Hadrian.

We wonder at the charming and delicately membered details on the one, the slender half columns scarcely 0.98 ft. in diameter, and on the other at the gigantic shafts of about 6.56 ft. diameter and nearly 55.76 ft. in height, as well as at the marble beams of the architrave over 21.32 ft. long.

Exactly as in the Doric and Ionic styles of architecture, we here likewise find the same forms, sometimes on the most graceful little architectural structures, sometimes on the mightiest colossal temples.

The material employed on most Corinthian monuments in Greece and Asia Minor is white marble, whose fine crystalline grain is particularly suited for the skilful execution of the numerous small sculptures and ornaments.

Polychromy generally becomes of less importance in the works of this style in comparison with the two others. Color deco-

decoration here chiefly gives place to relief ornament; the use of perishable colors must in time yield to the mode of natural ornamentation with colored stones, and thus to a monumental polychromy.

The gilding of certain parts may perhaps have been more commonly employed, than on the buildings of the Doric and Ionic orders.

A. The Substructure. -- The temples of this order likewise stand on a substructure of several steps, that is constructed of smooth blocks of stone in the manner already described; this is either the plain rectangular form of step, or that with a small rebate on the lower angle of the step, like those already found on the Doric Temple in Nemea.

On the upper corners of the steps of the Temple in Labranda, echinus mouldings are said to occur, but these were found in such a damaged condition, that their original form can no longer be determined with certainty, and they also give occasion for the conjecture, that they are merely the vestiges of the bosses for protecting the exposed angles, which had not been dressed off.(Fig. 328).

The only remains of larger temples of this style are those of the Olympeion in Athens, and those of the so-called Temple of Zeus in Labranda; the steps have entirely disappeared at the former and the substructure no longer remains in its original extent; only 13 columns at the southwest angle and two of the inner row on the south side still stand erect, a third having been overthrown by the storm of 1852. The steps of t the other are now in great part concealed by rubbish and ruins, so that their number cannot even be determined. Under these circumstances, there can be no consideration of any "curvatures", or of their intentional or unintentional existence; the 4 + 3 columns in the front row on the south and east facades of the Olympeion are no longer in condition to afford measurements to 1/25 inch.

b. Cell Walls. -- Likewise of these again few remains e exist, which do not differ in form and construction from those previously described. In Labranda the cell wall had a base and cap moulding after Ionic types.

Judging from the positions of the columns, they were built absolutely vertical, as for the Ionic temple.

Doorways exhibit, as for example in Labranda, high jambs with rich mouldings, arranged in three bands like the architrave, separated by beaded astragals, echinus mouldings and coves.(Fig. 329).

c. Columns, as in the Ionic order, are divided into three parts, for they consist of base, shaft and capital; they are not inclined toward the cell wall, but are accurately vertical and are of slender proportions, like the Inoic,with slight d diminution and entasis.

The lower diameter of the column goes into its height (including base and capital) as follows:--

On Olympeion in Athens	8 4/5 times.
On Monument of Lysicrates	10 7/10.
On Temple of Zeus in Labranda	9 1/2.
On Temple of Claudius Caesar in Ephesus	10 1/2.

The upper diameter is from 1/7 to 1/8 less than the lower. The base is usually the Attic Ionic on a square plinth; the mouldings are sometimes plain, sometimes decorated by interwoven bands, or laurel leaves then cover the torus. Including the plinth, it is equal to or rather higher than the lower diameter of the column.(Fig. 330).

After the Ionic system, 24 flutes of semicircular section surround the shaft of the column, are separated from each other by fillets, and end in rounded forms at top and bottom. In Labranda and elsewhere, a part of the scotia is occupied by a tablet, on which the name of the benefactor stands, at whose cost the columns were erected and finished, and whose meaning is, for example:--

"Leon Kointos, son of Leon, as he promised, dedicates this column with its base and capital."

On the Monument of Lysicrates, the flutes exceptionally end in the form of recurved leaves; a plain groove between these and the lower row of leaves on the bell of the capital was indeed originally filled by a metal band. An astragal, a round and fillet, treated as a band, as on the olympeion, separates the shaft from the capital.

"More refined and slenderer" than the Ionic, according to Vitruvius, for its height including the abacus, but without the astragal, is little greater than the lower diameter of t the shaft of the column, the capital is chiefly characterized by its bell form.

The low and tense echinus of the Doric and Ionic capitals, that expands under the weight of the entablature, is here replaced by a high moulding, that like the frieze, receives the burden and transmits it to the shaft.

The Egyptian prototype [1] imitated from the corollas of native plants, first bore no relief ornament; a circle of broad pointed leaves surrounded the bell at its base on the shaft; behind these extended to its upper margin closely set lancet-shaped leaves.(Fig. 331).

Note 1. Also compare the transitional form from Cyprus. (Original in British Museum in London; Fig. 332).

But we find the same arrangement on one kind of Corinthian capital, that on the Theatre of Dionysos and on the Tower of Winds in Athens, as well as on buildings in Asia Minor.(Pergamon). But the plant ornament is different; the Greeks chose for ornaments the plants native to their country, instead of the Egyptian flora, preferring those species that could be used in relief and were typical. A circle of acanthus leaves with narrow sedge leaves springing from behind them, and all wrought in relief, composed the decoration. But neither for the Egyptian capital nor for the Greek was the load laid directly on the bell; a square slab was interposed between the bell or basket (calathos) and the architrave.

This abacus does not project beyond the edge of the bell in the former; in the second, it projects in accordance with Doric models, and it is not shaped like a heavy slab without ornament, but as a delicately moulded and not very high covering slab (measuring about 1/6, or according to Vitruvius, about 1/7 of the height of the capital), whose sides abandon the straight line and in gently curved lines intersect sharply at the angles, or are there cut off.

The diagonal of this abacus sometimes equals twice the height of the capital, and sometimes is rather less.(Vitruvius

requires in Fig. 331, that b c = 2 h, while on the Olympeion, the length b c is less than 2 h. He makes the rise of the arc = 1/9 b d, while in many cases it is considerably less).

The profile of the abacus is either an echinus moulding with fillet and cove, or an echinus moulding with fillet, cove and another fillet.(See Monument of Lysicrates in Fig. 331).

The bands (astragals) of the Egyptian bell capital were merely painted, were in relief in the Ionic style, and are treated as rounds with fillet and apophyge as shown.

Besides this simple painted decoration of the bell, there already occurs at an early date in Egyptian Thebes a second and richer ornamentation thereof, which combines relief with painted ornament. Four of the large leaves enclosing the bell extend up to its top and there curve downward like volutes; (Fig. 331); the spaces produced between these leaves near the top of the bell are adorned with painted ascending forms. In a still tasteless manner, we find this arrangement of the ornamentation of the capital on that found in Phigaleia, though entirely changed into relief; merely the abacus here remains heavy and is painted in the archaic manner.(Fig. 335).

The volutes conceal in the most beautiful way the underside of the triangular corners of the abacus, projecting beyond t the edge of the bell, and appear to support these projecting parts.

A more perfected development is shown by the capitals ofthe half columns of the Choragic Monument of Lysicrates (334 B.C.) in Athens. The movement of the leaves and of the volutes is perhaps more labored, and the entire capital bears more the stamp of an experiment in sculpture, but a charming creation still remains.

The capitals of the Olympeion in Athens exhibit the form, that later became typical, with two rows of acanthus leaves, the helices resting on them, and the flower rising above the abacus.

New light has been cast upon the history of the Corinthian capital by the finds at the Tholos in Epidauros and in Delphi, the former being a work of the younger Polycleitos, who worked about the middle of the 4 th century.[1] (See Figs. 333, 334).

Note 1. See Robert, C. Archaeologische Märchen aus alter und neuer Zeit in Phil. Unters., pub. by Kiessling & von Willamowitz-Mollendorf. Heft 10. p. 198. "We know nothing whatever concerning the family relations of the younger Polycleitos. The tradition, that he was the pupil of Naukydes, is even chronologically possible, but is very doubtful.-- That he was t the architect of the Theatre and of the Tholos of Epidauros appears probable from the architectural forms of both buildings." Also see Foucart. Edifices d'Epidaure. Bull. d. Corr. Hell. Athens and Paris. 14 th year (1890). p. 592-594; "Pausanias mentions as most remarkable the Theatre and the circular edifice termed Tholos, both works of Polycleitos. It is known that there were two famous sculptors of that name; Polycleitos the elder, who flourished in the 5 th century, and Polycleitos the younger, who lived in the early part of the 4 th century. Brunn (Geschichte d. Griech. Künstler. I. 2 d edition, p. 152, 162. Stuttgart. 1888-1889) attributes them without hesitation to Polycleitos the elder. This opinion has been commonly expressed, but it is not based on any proof.

The stonecutters' marks found on the ashlars of the Tholos show that the Tholos is of the 4 th and not of the 5 th century, and it is further stated concerning a fixed date:-- " "Hence the Tholos was built after the Temple of Asclepios. The latter was erected before the year 352, probably about 3 375, but one cannot go beyond that date. The construction of the Tholos was undertaken afterwards, perhaps immediately, perhaps some years later. In any case, it is the work of Polycleitos the younger and not that of Polycleitos the elder, same as the Theatre."

For the capital in Delphi, see my Essay in Oest. Jahresh. 1906. "The Corinthian Capital in Phigaleia;" Fig. 335.

Everyone will agree with the conclusions stated in Note 1 above, who has seen and carefully examined the architectural details of the Tholos. The forms have no relation to those of the 5 th century, which likewise occurs on the Tholos in Delphi. The Corinthian capital in the Grecian mother country was adopted to a greater extent only in the second half of the 4 th century. (Epidauros, Tegea, Olympia, Samothrace, Delphi).

The erroneous view expressed by Bötticher [1] was indeed caused by the doubtful statements of Brunn (see his work), that the Corinthian capital of the Tholos in Epidauros was about 100 years earlier than that of the Philippeion, and it is indeed to be considered as rejected.

Note 1. Cent. d. Bauw. 1885. p. 236.

After its precedence in Phigaleia (430 B.C.) and Delphi, t the capital indeed appears in a tasteless form still, but already much more importantly developed (350 B.C.) in Epidauros, and in Olympia and on Samothrace. Since Scopas is regarded as a contemporary of the younger Polycleitos, each combined the talents of a great architect and of a sculptor; then the capital on the Temple of Athena Alea in Tegea mentioned must have had the same date of origin as that in Epidauros.

Likewise on the Didymaeon near Miletus, besides the bolster capitals in the interior of the cell, there are given two Corinthian half columns. (See Antiquities in Ionia, pub. by Society of Dilettanti. Germ. Edition. 1829. Pl. 8. Chap. 3; text volume, p. 140), that must have stood at the right and left of the main entrance doorway." The volutes were destroyed and were restored by conjecture, from the form represented by a half capital at a larger scale." The piece exhibits close alliance to the capitals found within the Tholos in Epidaurosa

A pier capital like the Corinthian and from Megara-Hyblea, to be found in the Museum at Syracuse, is designated as "Archaic"(Fig. 310), which is indeed scarcely appropriate.

Vitruvius requires for the lower part of the capital the same diameter as that of the upper end of the shaft, excluding the apophyge and the astragal.

The capital is treated alike on all four sides, whether the bell is decorated by volutes or not, and it again adopts the general relations of the Doric capital, since it shows the same free suitability for peripteral designs. To this fact, combined with its beautiful form, is indeed due its supremacy over all other forms of capital in later times, even to the present day!

Another form of capital -- the so-called palm capital -- w was indeed likewise introduced from Egypt and was particularly

employed for the middle colonnade of two-aisled stoas.(Fig. 338). The Egyptian prototype from Soleb exhibits the high and recessed abacus (Fig. 337), while the pieces in Delphi and Pergamon show round abacuses (Fig. 340), that found at the Stoa of Eumenes in Athens having the moulded projecting abacus of the early Corinthian capital, where a peculiarity is to be noted.

The lower and vacant corners of the abacus are filled by a painted leaf (Fig. 339), an arrangement resulting from the s same feeling, which later led the architects of the Augustan period to beset the said angles with rosettes, and also those of the middle ages to seek and find a similar transition between the square plinth and the circular base of the shaft. -- Instead of the lanceolate leaves on the bell decorated by acanthus leaves, there also occur broad water leaves, that are similarly transferred to the pier and ante capitals, as in Mylassa, for example.

The route followed by these forms of capitals -- with sedge and palm leaves -- passes from Egypt across Asia Minor to the Peleponnessus, these being the articles last imported!

Entire columns, half columns, isolated piers, antes and pilasters, are also afforded by this order, under the same assumption of a triple division into base, shaft and capital. For pilasters the shaft is chiefly plain, or as an innovation there occurs on them a border with sunken panel. (Hadrian's Gate and Monument of Philopappus in Athens, Doorway in Mylassa). Their capitals bear the form of the capital of the entire column, transformed to a flat surface.

As a beautiful example of an ante capital, whose forms were derived from the corresponding columnar capital, may serve the ante capital of Ancyra.(Fig. 341). The peculiar capital found near the Propyleion at Eleusis, at least still preserved in fragments, that perhaps once supported a tripod, may also be mentioned here. Winged lion-rams with lions' paws p project above the series of acanthus leaves at the angles of the capital, and they are connected by beautifully intertwined scroll ornaments; the recurved abacus,as on the columnar capitals, has a slight curve outward at the middle, that ends

in a slightly projecting flat.(Fig. 342 [1]).

Note 1. See die Propylåen des Appius Claudius Pulcher in Eleusis from drawings of J. Durm in Zeits. f. Bauw. 1876. p. 437 et seq.; Pl. 63. Also Michaelis, A. Das sogenannte Dreifusskapitel von Eleusis. Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abth. Vol. 14. Athens. 1889. p. 9; lastly, Lenormaot, F. Antiquites d. Eleusis. Rev. gen. d'Arch. 1868. p. 101-8, Pls. 1, 2, 3. --- "The Dilettanti found the two ante capitals very much mutilated. We (i.e. Lenormant and his associates) have uncovered them anew, together with a well preserved capital of a column, which had escaped the English examination. -- The lower part is ornamented by a row of acanthus leaves, from which spring at the angles the forms of winged chimeras with lions' paws and heads, to which are added ram's horns.

The heads of animals are wanting in the capitals published by the English architects and they have been made griffins."

That in view of these facts and of the publication mentioned in Revue Generale d'Architecture and in Zeitschrift für Bauwesen, Michaelis always speaks of "griffins" remains singular.-- For supporting consecrated gifts, the capitals under consideration with their peculiar form of abacus could not have served, according to the researches of Michaelis, Dörpfeld and Kawerau,(See Michaelis, p. 10), while the contrary was assumed by Bötticher in his time.

For columns of this order intended for supporting consecrated gifts, the form of capital experienced a change, in so f far as the abacus received a triangular shape instead of square for receiving the feet of the tripod. The sides of the abacus were then curved inward in a similar manner and the sh sharp angles were cut off.

On this idea is based the most beautiful of all tripod supports, the unfortunately much injured crowning marble finial of the Choragic Monument of Lysicrates with its series of waterleaf, acanthus, and of the most magnificent volute scroll ornament, that has ever been created in art.

The acanthus is sharply cut on all Grecian monuments, the entire leaf being always divided into separate symmetrically arranged parts, which consist of a group of 3, 4 or 5 or more

delicate and pointed separate leaves, separated from each other by strongly projecting bands. The leaf extends upward in beautifully curved lines; its apex is gently recurved without thereby producing the effect of being broken or wilted; elastic and full of life, it closely adheres to the form of the bell. An example from the Alexandrine period is given in Fig. 343 from the Temple of Artemis at Magnesia-a-M. (original in the former Pergamon Museum in Berlin), on which the leaf points are made shorter and the pipes are rounder.

The acanthus represented in Fig. 344 was drawn from a fragment found in Athens and illustrates the treatment of the different parts. A capital exhibited in the former Museum of the Theseion in Athens shows the whole leaf and is at the same time an example of the degree of "ossification", to which the magnificently inspired motive of the bell and volute capital could sink.(Fig. 345).

Since the Egyptian bell capital was in the beginning introduced as a basal motive for the Greek Corinthian, it should finally be mentioned, that the same likewise already occurs on Assyrian relief sculptures, although in a far more uncertain and indefinite form.(See the collection of Assyrian capitals by G. Rawlinson).

The spacing of the columns is restricted in nowise and is just as free from restriction as for the Ionic order. The distances between axes are equal, and on the olympeion in Athens are 18.014 ft., thus being about 0.197 ft. greater than for the middle passage of the Propyleion there. The architrave block at the angle measures 21.494 ft. long.(Fig. 348).

d. The Architrave is imitated from the Ionic, has a crowning moulding like that, and its front surface is subdivided twice or thrice; the lowest bands were then frequently small and unimportant in comparison with the upper one (see Labranda); the face turned toward the cell wall is frequently lower than the front side, and the under surface is generally decorated by a narrow sunken panel.

There is no ornamentation on the fascias; but for example on the Choragic Monument of Lysicrates, these were utilized for the dedicatory inscription.

e. The Frieze, as in the Ionic order, is plain or bears sculptures, but in either case it is from 1/2 to 1/3 lower than the architrave.(See Olympeion, monument of Lysicrates, Incantada in Salonichi, Labranda, Mylassa, Ephesus). But the plain flat form of the Ionic frieze is likewise abandoned, and the characteristic innovation is introduced instead, that consists of an elastically curved frieze as already mentioned. At Labranda it is swelled in a convex line, while in Salonichi, Mylassa and Ephesus, the form of the bell of the capital is repeated. The curved frieze then generally remains plain or is merely decorated by plant ornament, though vertical so-called pipes ornament the frieze of the Incantada.(Fig. 347) [1]

Note 1. The same ornament is also found on the frieze of the Ionic Temple at Aizanoi.(Asia Minor).

f. The Main Cornice is either taken unchanged from the Ionic order, is treated as a dentil cornice (see Monument of Lysicrates, Labranda in Fig. 343), or there occurs another characteristic innovation, the addition of modillions between the dentils and the projecting cornice. These were moderately large horizontal projecting beam ends, as on the Olympeion, subdivided into two parts in height, surrounded at top by an echinus moulding, were plain brackets as on the internal cornice of the Tower of Winds at Athens, or richly ornamented volute modillions, as on the Temple in Ephesus.(Figs. 347, 349).

In many cases, all members of the main cornice, such as the projecting cornice, cyma and intermediate members, are covered over with sculptured ornaments, continuing and completing the richness of bases, capitals and frieze. The main cornice of the Choragi Monument of Lysicrates received a very effective crowning ornament in the series of arched and connected, closely set antefixas, placed on the upper edge of the projecting cornice like a crown.

The same members as for the horizontal crowning cornice, a are indeed found on the inclined pediment cornice, judging from the pediments of the doorways of the Tower of Winds in Athens. There the dentils are also executed on the inclined pediment cornices in a manner hardly justifiable by esthetics. The pediments on prominent monuments are mostly destroyed and

are not even found in fragments.

h. The Tympanum must have been distinguished by figure ornamentation, and its angles and apex by acroterias or figures, in accordance with the earlier motive of the Doric and Ionic orders.

i. Concerning the Ceiling and the Roof, although the monuments of this order belong to a later period, few data relating to the ceiling and roof remain, like those of the other orders, scarcely anything existing for us. Merely the ceilings of small rectangular buildings yet remain, of the Tower of Winds and of the Choragic Monument of Lysicrates.

Wild novelties in entablatures, but nothing beautiful, are afforded by the well known Tower of Winds, built about 100 B. C., the Horologium of Andronicos Cyrrhestes in Syria. The cornice in the interior (Fig. 349) with volute consoles, coffered cornice and dentils above it are developed illogically; on the exterior the rising wall terminates in a dry architrave, above which are arranged the not quite most beautiful figure reliefs representing the "winds", that are crowned by a weakly treated main cornice. The idea of the upper ending remains interesting, but its execution is weak. (See Division XII; F Fig. 453).

Quite absurd are the main cornices of the Sanctuary of Athena and of the Trajaneum at Pergamon. (Originals in the Pergamon Museum in Berlin; see the representations in the great P Pergamonwerke, V, 2, Pls. 12 and 2; p. 31, as well as Figs. 350 a, b).

k. The view of a remaining structure of the Corinthian order is given by the adjacent representation of the Choragic Monument in Athens, as it remained in the year 1869. (Fig. 351).

This order likewise utilized the human figure on its monumental buildings, yet more ornamental after Egyptian prototypes, than as isolated actual supports. The detachment of the human form from its ornamental restraint and its elevation to a real structural part, to be a free statical member, is here again abandoned, perhaps with a more correct feeling.

How and where the caryatids a and b of Fig. 352 were placed

can no longer be determined. They were in 1869 in the National Museum in Athens. Assured is the position of the removed figures on the Incantada at Thessalonica by the English drawings, but more still by the exhibition of the original works in the Louvre in Paris with the label:-- "Salonica, the ancient Thessalonica. Entablature and attic of the enchanted palace. Mission of E. Miller. 1864.(Fig. 354). The four Corinthian capitals supporting the entablature are genuine; only a portion of the entablature is ancient, the remainder being restored. Four base slabs are likewise preserved. Although incomplete, the elevation is yet on the whole with a beautiful effect.(Fig. 354, and the drawings by Stuart and Revett. Lief. 13, pls. 7, 8).

Figures attached to Corinthian piers, executed in white marble at 1 1/2 times life size, were found in Corinth and are now exhibited in the Museum there.(Figs. 352 A, C, a basket supporter found in Eleusis).

Crouching figures as supporters of stone slabs are preserved at the stage (proscenion) of the Theatre of Dionysos in Athens.(Fig. 355). The bust of a beautiful basket bearer ((5.71 ft. high), whose former use is unknown, stands in the Museum at Eleusis.

Figures of terra cotta, conceived as caryatids, are preserved in the Athens Museum and in the Berlin Museum, of the most beautiful execution.(Fig 352 B).

DIVISION VIII. RELIGIOUS MONUMENTS. (TEMPLES).

Slight are the vestiges of the monumental places for the v veneration of a deity or of relegious monuments from the heroic period,(Altar of Zeus Herkeios in the court of Tyrins a and on the Acropolis of Athens), shortly after the beginning of the first thousand years B.C.

"The nameless and impersonal deity of the principal period" required no house; worship was seldom a common one, uniting the people, and it was never performed in enclosed rooms,even in the best period, after the entire personal heaven of deities had been already created.

Trees, rocks, springs etc. were symbols of the deity, sacred places that one approached with reverence. The deity later became personal and was first revered in formless shapes, these being exhibited in certain places under the open sky, in caves and sacred trees, at all times accessible to believers for prayer and for comfort to the soul. An image of the deity, yet artless, an uncut stone after the ancient custom,Pausanias terms the idol later shown in the Temple of Hercules at Hyettus. He makes the primitive image of Eros at Thespia to be an uncut stone, and the highly venerated Charites in Orchomenos are rough stone blocks, fallen from heaven for Eteocles. The image of Artemis Cedreatis there stood in a great cedar, and the primeval figure of the Ephesian Artemis in the hollowed trunk of an elm. In Sparta two joined cross beams represented the Dioscures, in Cyllene was a standing phallus for Hermes; the image of the god in Amyclae is "ancient and artless and like a bronze column." -- Such images of perishable material required protection from wind and weather, a sheltered location, as we have seen for the images of Artemis; canopy-like protecting roofs supported by piers or columns, the simplest and most natural arrangements afforded the same protection. The archaic sacred wooden column of Oenomaos was protected by a roof supported by four columns; the roof borne by wooden posts, the sanctuary without walls on the market at Elis, perhaps the prototype of the later columnar Temple, indeed served for similar purposes. An increased protection was afforded to the sanctuary, the image of the deity and the

consecrated gifts by the enclosure of the place for exhibiting these, by the masonry cell, that received its light through a great doorway. -- To develop these architectural ideas and to bring them into monumental expression was reserved to the succeeding period.

Others desire to recognize in the Megaron of the king's palace (Tiryns, Troy, Cnossos, Phaestos, Mycenae) the prototype of the Grecian house of the deity;-- the dwelling of the prince, not of a common man, should be like the home of the deity on earth. Proceeding from this aristocratic idea, there was gradually developed the temple structure of the historic period, appearing from the haze of the preceding one without monuments. "The premycenaean, the Mycenaean and the Homeric world knew no temple architecture, the worship without an image required no permanent habitation." [1] The megaron was characterized externally, was surrounded by columns on two or on all four sides, and the whole was placed on a stepped structure.

Note 1. See R. Borrmann and J. Neuwirth. Geschichte der Architektur. p. 102. Leipzig. 1904. Especially Perrot & Chipiez. Histoire de l'Art dans l'Antiquite. VII. p. 350 et seq.

In these buildings devoted to the veneration of the deities is found the climax of the artistically most important undertakings of every people, both in the domain of architecture, as well as those of sculpture and painting; the artistic idea is thereon most spiritedly worked out and expressed, the expression of form is the most perfect. Therefore in them will the system of Grecian architecture be chiefly developed and is to be studied.

As already stated and will again be shown, Grecian art stands on the shoulders of oriental art (Egyptian and Asiatic). Reminiscences of the East reecho throughout the plan of the Grecian temple. Thus the most ancient temples of Sicily (4 temples in Selinus) exhibit the much elongated form of cell, longitudinally divided into three apartments, the vestibule, the holy place and the most holy place, as in the Asian temples of the deity; excepting that the most sacred place is not surrounded by additional rooms, or is wholly withdrawn from the view of believers. (Fig. 358). The porticos, which sur-

surrounded the courts, are now directly attached to the temple, that forms a great protecting roof supported by columns, a m monumental canopy,"the most ancient symbol of terrestrial and celestial supremacy," which extends uniformly over the portico, the cell,and the statue of the deity.

The oldest temples, whose mode of construction is not stated by Pausanias, nor whether they were Doric or Ionic, were indeed not very different from the usual dwellings of men, w whose good and bad peculiarities, manners and customs, hates and loves, continued with the gods, who had become personal. The walls of these buildings were constructed in the simplest manner, and only one end wall contained the great entrance d doorway, extending almost to the ceiling, which from this ratio of dimensions, must have had a purpose other than that of admitting visitors, for which smaller dimensions would have sufficed. (Compare the doorways of the Gothic cathedral with reference to the capacity of the interior, remembering that in this case, the sanctuary must accommodate numerous worshipers).

Besides the closed vestibule also occurs the open one. Antes then terminate the side walls, which retain their original extent; the transverse wall and its doorway are replaced by columns, the principal entrance doorway then being placed in the division wall, which formerly enclosed the sacred place. (Fig. 35?). In another change of the plan, the third division of the cell, or the most sacred place disappears, giving place to an open rear portico. The statue of the deitn retains its position in the cell enlarged in this manner; the personal deity becomes nearer to man. (Compare the "heseion).

In certain cases as for example in the Parthenon, there was also added another apartment accessible from the rear, and which must have served as the treasury of the state, under the guardianship of the deity. The formerly unbroken interior was then divided by colonnades placed in it, one above the other and separated by a simple architrave, i.e., the cell w was divided into two narrow side aisles and a broad central aisle. The interior became in a manner two-storied, and small stairways gave access to the different divisions in the height (Fig. 357).

and to the attic.(Compare Akragas). In a further state of p progress, the side walls of the front and rear porticos recede, then projecting but slightly beyond the walls containing the doors, the earlier wall and doorway is replaced by antes and columns and is changed into a complete colonnade. (Compare the Parthenon). A still more important enlargement of the cell finally led to the pseudodipteral temple, to a plan like that of the Temple of Zeus in Akragas.

Neither in the most ancient monuments, nor in those of the best period, is the colonnade anywhere dependent on the cell; the antes do not range with those of the columns the pronaos or opisthodome; the ceiling beams appertaining thereto are arranged just as independently without reference to walls or columns of the stone temples.

The new idea, which is always expressed in the structure of the Grecian temple and is in opposition to its oriental kindred, is that of a sacred cell surrounded by columns and standing on an elevated substructure. Rather dry in comparison to the Hellenic, this form of temple is also found in Egypt, for example, in the little Temple at Elephantine,[1] vanished since the beginning of the last century; the house there has in the ground plan the form of an elongated rectangle, and it exhibits the same enclosing row of columns or piers on a slightly raised platform, to which a narrow flight of steps leads.

Note 1. See its description and illustrations in Perrot & Chipiez. I. p. 402, 403. This form of temple appeared under the 18 th dynasty, but it was also still retained in the Ptolemaic period.

The form of pediment facade with antes and columns, which Vitruvius prefers to consider as the most ancient type, and which has its motive in the tomb facades of Asia Minor and in the Egyptian grotto tomb of Beni Hassan, could not have alone belonged to the temple, as shown by Semper, and also further proved by the treasuries in Olympia, which mostly have facades with antes and columns.[2]

Note 2. Therefore others also allow the Grecian temple to have originated from the treasury.

The sanctuaries of the Greeks stand in isolation on steep

heights (Assos, Egina), or are surrounded by a sacred wood, are placed on a noble terraced structure, or located in the lower portion of the city (Theseion, Olympeion), or they are frequently grouped on a strictly limited area (Athens, Selinus, Olympia, Akragas); they are often placed in consecrated precincts surrounded by strong walls, acces to them being obtained through magnificent portals with porticos, propyleions, and are also surrounded by protecting porticos, treasuries, gifts, etc., often affording security in troublous times to the unwarlike portion of the people and to its treasures. (Fig. 358; elevation of the Temple at Assos).

The temple should produce an effect more by its form than by its masses. I here except the pilgrimage temples, the Artemesion at Ephesus, and the two gigantic structures dedicated to Zeus Olympios at Selinus and Akragas, "exalted within and quietly beautiful." They are therefore usually of moderate dimensions, and the cell was almost always accessible to the people, though not intended for the assemblage of a devout multitude.

In the Temple of the birth goddess Eileithya on the Cronion hill at Olympia, any one could enter the front apartment of the double temple, though priestesses alone entered the inner one.

The Temple of Aphrodite in Sykion was only accessible to t the female temple servants and to a certain maiden; all others only beheld the goddess and prayed to her from the entrance.

In a double Temple of Asklepios there, admission to the second part was only permitted to the priests etc. [3]

Note 3. See Pausanias. VI. (Elis, second part). 20, 25.

Thus for example, the cell of a temple at Selinus has a width of 24.93 ft. with a length of 39.04 ft.; the centre aisle of the Heraion at Olympia is 91.34 ft. long and but 12.47 ft. wide; the centre aisle of the Temple of Geus at the same place is 94.00 ft. by 21.39 ft. In the last case, only one-third of the cell was used by the people, since the remaining two-thirds were occupied by the statue of the deity and the tables for garlands. A space for the "people" thus remained there about 21.34 ft. by 31.17 ft., or of 667 sq. ft. in round num-

numbers, a superficial area corresponding to that of a large living room in a modern house.

The centre aisle of the temple measures:--

Temple on Egina 10.73 × 12.80 ft. = 449.96 sq. ft.

Temple in Phigaleia 14.47 × 41.99 ft. = 522.05 sq. ft.

Temple Parthenon 32.41 × 83.93 ft. = 2722.20 sq. ft.

In these cases likewise, if two-thirds is reserved for the statue of the deity and the altar, there remains for the "people" at Egina and Phigaleia the small areas of 150.70 and 1 172.22 sq. ft., and in the Parthenon 914.95 sq. ft., or rather more than at Olympia. "Great festal processions" could not occur in these interiors, especially if the space occupied by the numerous gifts were also deducted!

Let us therefore omit the "people"and the festal processions from the temple, assuming it to have been only entered by individuals, and principally by priests alone, who offered bloodless sacrifices on the small altars before the statue of the deity, while the burnt offering occurred on the great altar before the temple,(In accordance with Asian usage).

As strikingly described by Vischer, the interior is therefore "a noble and richly decorated apartment for the deity, intended to be seen, the vestibule concentrating the mind of the observer on the whole before his entrance".

In accordance with the dimensions of the ground plan, the measurements of the height of the temple are unimportant.. The Temple on Egina measured 34.79 ft. high to the apex of the pediment, that in Phigaleia 35.76 ft., and the Parthenon 62.66 ft. On a repeatedly divided substructure, broad and quietly coursed, rose the cell surrounded by columns spanned by architraves, succeded by the frieze and the croyning principal cornice, the structure receiving its final and expressive ornamentation by the gently inclined pediments decorated by figures. The exterior of the temple shone with rich gilding and with brilliant decorations in color, heightened by metallic accessories, in accordance with the high colors of surrounding nature. The three colossal temples in Selinus, Akragas and Miletus are particular undertakings outside the normal scheme.

According to the evidence of the writers, to traditions, and

to finds in the localities, there may be established the following methods of construction for religious buildings, with reference to the materials employed.

I. Those constructed of wood, with the use of cut or split stone substructures, walls of sundried bricks, with clay terraces or clay tile roofs. Here are to be counted:--

a. The first Temple at Delphi, that according to Pausanias, was built in the earliest period of laurel wood, from branches of the laurel in Tempe. Therefore this sanctuary had the form of a hut.

b. The second Temple there was constructed by bees from t their wax and feathers, really by a Delphian named "Pteras". The fable that the temple was made of herbage growing on the hills, the still green plants being woven together, was not believed by Pausanias himself.

c. The third Temple was of bronze, i.e., the woodwork was covered by bronze plates. Acrisius indeed had already built of bronze a room for his daughter, and there still stands in Lacedemon the Temple of "Athene Chalkiokos", which is also attested by Plutarch. The Forum in Rome was further furnished with a bronze covering, by which is indeed meant the temples and basilica on it.(648-645 B.C.).

d. The fourth Temple was first built of stone by Trophonios and Agamedes, but it burned down again.

e. The present Temple in Delphi was erected by the Amphictyons to the deity with the sacred treasures; it was constructed by Spintharos of Corinth -- of ordinary limestone and marble.

Certainly a notable sequence from the most perishable to t the material most monumental in execution!

f. The Temple of Poseidon Hippios (Pausanias. VIII. Arcadia. 10), six stadias distant from Mantinea, was only known to Pausanias by hearsay -- as he expresses it. It was framed f from oak beams by Agamedes and Trophonios. About this Hadrian had a new temple building constructed. We learn nothing of any definite style; the structure indeed must have been merely a kind of blockhouse in small dimensions, which Hadrian enclosed in a stone temple.(Perhaps an arrangement simi-

similar to the Casa Santa in Loreto or that in S. Maria degli Angeli near Assizi -- the Portiuncula.

g. concerning the Heraion built 15 stadias from Mycenae, Pausanias says (II. Corinthiaca. 15), after he described the stone Temple there and referred to the consecrated gifts in the vestibule and the chryselephantine statue of Juno in the Temple:-- "If one goes beyond this Temple, he finds the foundations of the earlier Temple, and something left by the flames. It burned by the fault of the priestess Chryseis, who was asleep, when the lamp burned down and the flame seized on the wreth. But in spite of the great misfortune, her statue was left standing pefore the burned temple as one of the consecrated." This must refer to a fire in the interior, but which caught on and destroyed the ceiling and roof, when the furniture of the temple was in flames.

Concerning the present condition of this national sanctuary in Argolis, Baedeker states:-- "On the highest terrace, above the far visible Cyclopean wall, stood the ancient Temple; there is still preserved but a part of the ancient masonry of the stylobate with the sites of three columns".

A comprehensive, thorough and fine representation is given to us by the American Archaeological Institute at Athens. [1] The editor therein remarks (p. 110), that before excavation the place was covered by a hardened mass, that he found the marks of the locations of 3 columns, which had a diameter of 2.62 ft. and a distance between centres of 11.48 and of 11.51 ft., concluding from this, that columns and entablature were certainly of wood, basing this opinion upon the small diameter and wide spacing of the columns ("as indicated by the small diameter and wide spacing of the columns"), whereon he further concludes, that beneath the stylobate was no foundation, that only remains of charcoal and burnt fragments of wood were found, and that all stone architecture was wanting. Stones might indeed again be used for the new temple, so far as they were not burned into lime, the charcoal remains would be sufficiently furnished by the wooden ceiling of the outer portico and of the cell, as well as by the woodwork of the building, on which I remark, that the column diameter of 2.62 ft.

is not small and the distance between centres of columns at 11.43 ft. is large, especially when wooden beams are assumed. The stone architraves for the temples in Egesta, Akragas, Selinus, on the Greek Temple in Pompeii, and in Paestum measure: 13.78, 15.09, 12.14 to 13.94, 14.69, and even the greatest a are not long!

Note 1. Waldstein, Ch. The Argive Heraeum. 2 vols. Boston and New York. 1902. American School of Classical Studies at Athens. Archaeological Institute of America. I. p. 110 et seq.

The marble columns on the Mausoleum in Halicarnassus have about 29.52 ft. height for a mean diameter of 2.72 ft.; those on the propyleion of the Megaron of Demeter near Selinus are 2.10 to 2.47 ft.; those on the oldest temple in Metapontum having a lower diameter of 3.23 ft.; the columns on the market Temple at Pergamon even one of 1.97 ft. Thus even the wide spacing and slenderness of the columns does not prove a wooden architrave, and if no stone remains longer exist, this Heraion shares the fate of so many other monuments. Were perhaps the cell walls in Egesta built of airdried bricks, since they have now disappeared?

h. Of the Temple of Apollo at Thermos,"that formed the centre of Aeolic civilization and strength", there is also current the saying, that it was first an ancient structure of wood, that was transformed into a stone temple. [2] The terra cotta metopes found near it with paintings with black figures, which indicate the 6 th century B.C., the terra cotta drip tiles a and cymas of the 5 th and 6 th centuries only denote frequent repairs, and the distance between the axes of columns of 3.10 to 3.86 ft. as well as the diameters of the columns from 2.30 to 2.46 ft. fall in what is said under g.

Note 2. See Praktika. p. 57. Athens. 1899. Then Ephemeris 1890. p. 161. Also Anton Springer. Handbuch der Kunstgeschichte. Altertum. I. Revised by A. Michaelis. p. 126. Leipzig. 1904.

The said Temple of Apollo at Thermos, according to Antike Denkmäler,(1902-1908), was subjected by G. Satiriades and G. Kawerau to a more thorough examination and was completely represented in text and illustrations.

Kawerau states thereon, that an earlier temple existed from the 6 th to the 3 d century B.C.1 from which abundant terra cotta materials, but not the smallest fragment of a stone entablature, from which it may be assumed, that only wooden entablature, ceiling and roof, with a back walling of airdried bricks as the materials, that could technically be combined with a wooden entablature, came into use for the building. Bricks and split stones combine with wood just as well or as badly. Where would then be our entire mediaeval and modern half timber construction?

There were found pieces of painted and strongly undercut drip tiles, the arrangements for fastening them not being recognizable. These terra cotta cornices are not exactly to be termed unusually "large", since they do not exceed the dimensions of the bipedal Roman tile of 1.97 ft., or attain those of the roof tile from the Palace of Artaxerxes (Louvre Museum) of 1.77 × 2.66 ft. and those of many Etruscan tiles. On the contrary, the height of the face of 0.64 ft. is to be recognized. The cymas with a double round are likewise 0.64 ft. high and are perforated at top, like similar Etruscan and Roman pieces.(Alatri). On the basis of this material, Kawerau assumes a wooden architrave "on columns, just as these may always have been shaped". Their lowest drums of stone are assumed! Their diameter is 2.13 ft., from which the width of the architrave may be taken at 1.34 ft. Kawerau constructs the architrave of two wooden beams lying side by side, "in order to not require improbable dimensions of timbers", and indeed with right, since Vitruvius also prescribes this.

On the two beams must then necessarily be fixed a protecting covering, from which rose the structure of the frieze and cornice. Their form remains unknown. The terra cotta metopes are preserved in several entire pieces. Every slab shows on the upper side two moulded projections, that indeed served f for fastening on an upper longitudinal wooden strip. That must indeed be assumed. The painted field is surrounded by a stripe of a single color. The terra cotta triglyphs were not found on the temple. Were they therefore of wood? Yet in Thermos at other places were found the terra cotta trig-

triglyphs of a small archaic building. Still Kawerau leaves the question open, whether wooden or terra cotta triglyphs were employed on the temple. The axial distance at the temple is 3.77 ft., from which the metopes are computed to be 2.62 ft. and the triglyphs at 1.76 ft. wide. Kawerau assumes the woodwork to be protected by painting, since the terra cotta covering plates were not found. Terra cotta box coverings, like those used in Sicily and lower Italy, could not be proved. When it is either stated, that such box pieces were determined only as coverings for stone cornices, then the author does not know of the pieces from Metapontum with the long copper nails.(Formerly in the Museum at Metapontum; on questioning, it was said to me, that the nails are now in the Naples Museum, were transferred to the prehistoric collection and are n not now (1907) exhibited.

With the Vitruvian theory of origin, the frieze of this old stone-wood-terra-cotta temple also has nothing to do. The t triglyphs in the present case cannot be regarded as the coverings of the ends of transverse beams; for the free length of the ceiling beams outside and inside the cell is but 6.56 ft., and there were not required beams 2.95 ft. high, as assumed for the metopes. Yet for a restoration, I would make the ceiling beams stronger and placed higher, adding wooden posts between the architrave and the ceiling beams, and also would limit the use of airdried bricks to filling the spaces between the beams.

I give great credit to Mr. Kawerau, that he has proceeded so technically in the explanation of the finds, and that his assumptions have been made with as much foresight as possible, free from all preconceptions, and that he has spared us Doric wooden columns, like those of Evans.

(See the very interesting and beautifully represented section through the entablature by G. Kawerau, a reproduction of which is given in Fig. 359, after plate 49 of his work.[1])

Note 1. This publication was the last gift made to me by him before his death, for which I could no longer thank him. Let the figure be dedicated to his memory.

But it should not be said, that before the stone temple, a

temple did not stand here on the site, yet the latter certainly had nothing in the least to do with the plan and treatment of the stone structure.

i. On the oldest Ionic Temple at Locri O. Puchstein remarks:[2] "Lastly in opposition to Petersen, we could recognize no vestiges of wooden columns or of wooden coverings of the parastades." -- This here also one was not contented with the discovered remains of the stone columns of the second (later) temples, but took up the wooden columns of the preceding one, on the basis of the axial distances found. The stylobates of t the two temples lying transversely over each other (same, pl. 51) are of limestone. Of the older and smaller temple, at the building of the second, there was only removed what fell on the building line. The older one must originally have been arranged one-sided (en parastasin), only receiving a peripteral portico later. For covering it may have served some pieces of painted tiles with archaic ornaments found in the rubbish of the temple. The stylobate step has a width of 2.89 ft., and an average diameter of column of 2.56 to 2.62 ft. must be assumed with an axial distance of 10.60 ft. The diameter of the column and distance between centres agree approximately with those of the Argolic Heraeum.

After one recognizes the position of both temples with regard to each other, and if one considers the resulting conditions at the building of the second temple, he will scarcely have to reckon here with the possibility of tangible evidence for a possible wooden temple, and by the accepted dimensions of the columns and their axial distances, nothing will be proved.

k. Because elevated to the system, the Heraion at Olympia chiefly requires consideration. It is said of this, that "through Dörpfeld's thorough treatment it has become the classical building for the knowledge of the origin of the Doric style." It is permitted to any one to believe that. But if it be definitely assumed, that the cell wall from the upper edge of the external course of slabs now in place consisted of airdried bricks, that the antes and the entablature were of wood, that originally the columns were also of wood on the

places where the stone columns now stand in part, and that t these were gradually replaced by those of stone, as one became rotten, -- then should this at least not be proclaimed in the loud tone, suited to an actual fact behind it. What still exists are the remains of a structure of mixed methods of construction, with stone substructure, wooden ceiling and wooden framework of the roof, that was covered by clay tiles. Nothing more can be proved.

What has led to the interpretation mentioned for the ruins is first the passage in Pausanias V, 16), and then the diversity of the stone capitals in form and dimensions, as well as the fact, that stone architrave, frieze and cornice blocks f for the building were not found in the excavations.

Pausanias says:-- "According to the Elian tradition, the inhabitants of Skillus in Triphylia erected the Temple about eight years after Oxylos [1] assumed rule over Elis. This (i.e. that seen by Pausanias) was built in the Doric style and was surrounded by columns; of the two in the rear part, one is m made of an oaken trunk. The Temple is 63 ft. long and the builder is unknown." Therefore the wooden column stood in a place in the rear part sheltered from wind and weather, where consecrated gifts were otherwise exhibited, and that it is r rather to be regarded as a memorial of the earlier ancient sanctuary standing on the same place, cannot be denied.

Note 1. Oxylos was the leader in the Doric emigration in 1096 B.C.(1104?), who with the Aetolians conquered Elis, which then formed the ruling aristocracy in the country, and only in 471 (?) built Elis -- its great and populous city.

Pausanias was struck by the single wooden column, itself evidence of departed splendor. Would he indeed have been silent, if also then there existed a wooden entablature, i.e. wooden architrave, frieze and cornice? Or would these have been successively changed with the columns?

What Pausanias saw and described was the completed stone temple with its material details and the single interesting show piece, an ancient wooden column, that he expressly designates as Doric. The sum of the irregularities in the execution still remains as problematical and as dark as the assumed

story of the transformation. But he was not certain of the incomplete petrifaction of a wooden temple built by the inhabitants of Skillus in the time of the Doric invasion!

It is said of the wooden columns in the great Olympiawork (p. 30), that it was "self-evident"that their height must have been the same as that of the later stone supports; their diameters could not have changed much,"since the width of the st stone stylobate was 4.40 ft. and therefore wooden columns must have had a diameter of 3.28 ft., which would be better if increased to 3.73 ft. (Sic!).

The form of the wooden columns in details is entirely unknown, but one must conjecture, that they also had the "cake-shaped Doric capitals", since then the differences between t them and the stone columns would at least not be too great. (Sic!). That will certainly not be doubted, so far as it affects the conclusions of the principle.

Nothing was found of the entablature, which with the good preservation of the temple (in what did this consist ?) might be certain proof, that a stone entablature newer existed.This deduction is not overpowering, after what we otherwise know of the ruins of ancient monuments. "The entablature must have remained wooden until the destruction of the temple" is further stated. Therefore Pausanias must have seen it, and should not this statement have been transmitted? Likewise the absence of holes in the abacus of the capitals is evidence for the wooden entablature, which was protected from sun and rain by the projecting main cornice, which was itself again constructed of wood! On plate 18 of the Olympiawork, the ashlars of the cell wall of the out layer are represented in part with single, then with double, but are furnished with no dowell holes whatever. And why should they be on the abacus, where architraves 10.73 ft. long served on uncertain columns? It is correct and in accordance with my notes, that on the 4 th upper course of the cell wall, the dowell holes and also the sinking on the bed surface are wanting, and that the stones do not touch at the end joints on a border, but only on a sharp edge. But the upper surface of the said course lies at the same height as the course of slabs represented. Here

would men indeed create an equalizing in the masonry, from t the nature of the bed, in order to carry up the wall from thence. Nothing requires the acceptance of a continuation in airdried bricks. Wooden coverings to beautify the angles of plastered masonry are certainly believable, even for our own time as well!

l. It is stated for the Temple of Hera at Metapontum, that its columns were of vine wood, on which Pliny (Hist. Nat. XIV. 3) remarks, that on account of its size, the vine was justly by the ancients counted among the trees.

m. What Pausanias further says (V., 16, 20) concerns no temple, but merely architectural parts pertaining to temples. Of Elis he writes:-- "The Column of Oenomaos, so-called by the Elians, stands at the left on the way from the great Altar to the Temple of Zeus; for there stand 4 columns, that with the roof supported by them serve to protect "the wooden column", which has suffered much by age and is held together by many iron bands." The column stood in the house of Oenomaos, the father of Hippodamia, and it was the only one remaining after the burning of that.

If we assume that Oenomaos built his house soon after the founding of the city of Elis (471), then this wooden column had lasted 371 years, certainly for most of the time beneath a protecting roof supported by stone columns and held together by iron bands, also like that in the Heraion at Olympia!

Pausanias (VI, 24) also mentions the Tomb of Oxylos on the Market at Elis as a building, "low and without walls, whose roof was supported by oaken columns", indeed as a "special f form of temple", that was indeed merely a projecting roof for the monument mentioned. If the columns were of the time of Oxylos, when Pausanias saw them, they must have been approximately 1000 years old!

n. Of cedar wood was likewise the first shelter, the so-c called chest of Cypselus (Paus. V, 17), the later tyrant of Corinth, in which he was concealed by his mother. And a structure with a wooden nucleus was also asserted to be the Temple of Athena Chalkiokos (which had a bronze house) in Sparta, (Paus. III, 17), if the long continuance of the time of its

erection does not express the contrary. Tyndareos began the structure, that his sons continued after his death, but it was only completed many years later by the Lacedamonians. Its internal covering of bronze plates, on which were repeated the labors of Hercules and also historical events (indeed as works in relief), were the most important and worth seeing in the capital, according to Pausanias' opinion.

A bronze room in a subterranean building among the Argives, that Acrisius had built for the preservation of his daughter, is mentioned by Pausanias (II, 23). Walls covered by gold plates were also shown by the Temple of Solomon at Jerusalem (1000 B.C.) and still earlier by the Tholos at Mycenae.

Much that is positive in the search for original wooden temples cannot be recorded; the painted representations on pottery from the early period likewise afford nothing definite or even merely indirectly in the representations of other public buildings, the spring-houses. Thus for example, the early Grecian so-called Francois vase (500 B.C.) [1] shows us two Doic of such, consisting of strongly diminished columns between antes, with an architrave laid thereon, triglyph frieze and cornice adorned by leaves, after the Egyptian or Etruscan type, above this being a flat vaulted roof (indeed a clay roof). All bears the character of a simple and clear wooden construction, where the capitals on the through shafts of the columns must be regarded as knots, as also those on the but slightly projecting pear shaped capitals of the first view do not oppose execution in wood. Another view is shown by a black figured hydria from the time of the Tyrants (560 B.C.?) [2] that represents a portico supported by four thin columns with corbels placed thereon. The architrave on them is stunted and is properly only indicated, the regulas are recessed and are merely sketched, as well as the beam ends and the cornice. But here is also a wooden architrave expressed in form and proportions; one must only regard the capitals not as "Doric cake-shaped", but as corbels, as stated. The great projection already forbids the assumption of like dimensions in depth.

Note 1. Now exhibited in the Etruscan Museum in Florence.

Note 2. Now in the British Museum in London. Published by Th. Wiegand in Antike Denkmäler. II. pl. 19. Text p. 7.

On the question of the form of Grecian wooden architecture, O. Puchstein [3] also takes position and recommends care and restraint in the "indication" of the compound stone forms in wood, when he asserts;-- "On wood as the natural building material must men now attempt to explain the historical forms, rather than to reach backward. We have accurately learned by excavations in different countries and for different periods the use of the wooden column (the use indeed -- but not the form and decoration!), and for Doric ornamentation of the entablature, a certain influence of wooden construction is not to be absolutely denied. (Agreed, except that here the Ionic should be drawn upon to a still higher degree). Opposed to the manner in which the difficult question concerning the influence of wood is chiefly represented and answered, one could generally show rather more care and restraint and also somewhat more circumspection"-- which certainly must be acknowledged without reserve.

Note 3. Puchstein, O & R. Koldewey. Die Griechische Tempel in Unteritalien und Sizilien. p. 219 et seq. Berlin. 1899.

On the columns he notes:-- "Referred to the monumental material in which they originated, the column and the ante in t the Doric style is esthetically a stone (lithotomic) and not a wooden (xylurgic) creation. To represent an ancient Doric column as a primitive and still plausible wooden form is absurd --- etc." [1] Assenting to this principle would therefore determine, that wooden columns with their characteristic peculiarities and proportions of diameter to height are excluded from the two historical orders; where they occur on the representations of spring-houses and baths, they exhibit the forms and proportions required by wooden construction.

Note 1. Also compare on this, Bohnsack, G. in Brunswick: War die Heraion ursprunglich von Holz? In Bauz. für Wurtemberg., Baden, Hesse, Alsace-Lorraini. III Jarh. Nov. 10. 1906. No. 45, and in the same: Durm, J. III Jahr. 1907. No. 6.

It is otherwise for the entablatures and particularly for both orders.

If the ante temple (Temple-maison in Choisy, p. 424) is the oldest form of the Grecian house of the deity, as we must as-

assume in accordance with the still styleless Megaron of Demeter near Selinus (Gaggera [2]), to the ancient Temple of Athena (Hekatompedon) of about 550 B.C. on the Acropolis of Athens [3], and according to the archaic tittle temples, which go under the name of "treasury" (Olympia, Delphi, Delos [4]), then the first normal archaic sanctuary, built of ashlars, exhibits neither triglyphs nor metopes, but only simple horizontal enclosing main cornices and the corresponding pediment cornices, within which according to the finds, pediment groups were not impossible, and likewise must the Treasury of the Geloans at Olympia have been without definite stylistic ornament, -- while other contemporary buildings were given a triglyph frieze, both on the pediments as well as at the eaves.

Note 2. See Puchstein, O. Pl. 11; p. 82, from 7 th century B.C.

Note 3. See Wiegand, Th. Die archaischen Porosarchitekturen der Akropolis zu Athen. p. 108, Fig. 112. Cassel & Leipzig. 1904.

Note 4. See the great German Olympiawork and the now appeearing publications of the French on Delphi -- Les Feuilles de Delphes. -- Paris. 1902.1905.

Judging from the angle triglyphs, the latter design would require a change in the position of the ceiling beams, i.e., a so-called header, that appears scarcely credible for an ante temple built of wood, and as having nothing common with the simple ancient wooden construction, as it was expressed in the Lycian rock-cut tombs.

On the vase paintings mentioned, we have to conceive before us an open portico before a rear wall of masonry, whose free supports bear horizontal wooden beams lying parallel to the wall, that serve as support for horizontal ceiling beams. The separate beams are set at certain distances apart, thus leaving free spaces between their ends, that are left open or closed by panels, slabs or airdried masonry.

Above this entablature lie the somewhat projecting rafters, that afford protection to the lower parts of the building, and which by means of a continuous band connects and protects the ends of the rafters. The similar arrangement for protection

occurs for the beam stones, as for example on wooden houses in the Tyrol, Switzerland etc., on the ends of purlins, and which has remained in use till today. The fastening of the verge boadr required a special means, since a nailing of this against the end wood was also then regarded as bad or not permissible. A clay roof with smooth coating or a covering of tiles and in curved or hipped form terminated the building at top. This artless and simply noble means was employed on the structure, from which one could not depart in the later stone construction or mixed architecture, if the detail forms were also covered by painting or sculpture corresponding to the time. With reference to the statements of Vitruvius (IV, 1 to 4), Fig. 380 affords a view of the architecturally possible, represented without constraint, based only on what the vase paintings and wooden construction require. Yet simpler is the case, if we examine the front and side elevations of a Lycian tomb (see Division XIV, Tombs), that the ancient wooden house of the vicinity gives us from the bygone period. The South is conservative, and the hardy mountaineers likewise show this in the lands of every master, just as the wooden b buildings in the Alps have remained the same, at least until today.

On the Lycian structures there lie timbers or beams of large dimensions, protecting the enclosing walls and projecting therefrom at certain distances, on them being closely set unhewn and round trunks, that form the ceiling and support the roof, whose edges are enclosed and finished by timbers. The same expression of form as in these buildings in Asia Minor, we have learned to recognize in the second great Tholos in Mycenae, and which proves its high antiquity more than all else. This "native" style has also been faithfully retained by the Ionians in the great stone temples, when they continued faithful to the sequence of the parts of the entablature in the transformation from wood to stone. The arrangement of a frieze in the ancient stone buildings (Priene, Temple of Asclepios) is frequently doubted.(?)

On the architrave lie the square hewn timbers instead of round logs, which are reproduced in the dentils. Like the

Doric, the Ionic race has also remained honest in its structures; both follow the same path, and under the same conditions, hold themselves free from a direct transfer of wooden forms into stone.

The ante temple results in accordance with the preceding f from a construction of the entablature and cornice in wood, according to the location -- the Doric style being assumed-- a triglyph frieze being only on the pediment end or only on the longer sides, just as in the Ionic style the round or square ends of the timbers, or the dentils developed therefrom, can also only occur on the sides or on the ends in the wooden style, and not on both at the same time. The entablature and its cornices in the Doric and Ionic orders doubtless originated from the original wooden construction of those parts, just as it is certain for the Doric, that its form of column had nothing to do with such.

If now on the oldest ante buildings in stone the existence of the triglyph frieze on all four sides may be proved, which is the case without exception on stone buildings from the 7 th and 6 th centuries B.C., then must it be said, that men were not contented with a petrifaction of wooden construction and freely employed the given structural motives, when the temple became stone. The triglyph frieze on all four sides indicates a freedom from the simple and sound construction, as we have learned to know it from the porticos of the fountain houses and the rock-cut tombs in Asia Minor, and a complete purely decorative conception and treatment of the said motive, that is yet enhanced, as soon as on the same building occur triglyphs above the antes of the "prodomos" and the opisthodome and on the entablature of the enclosing portico on all four sides. The ancient Hekatompedon (in antis) on the Acropolis of Athens (before 561 B.C.) had a triglyph frieze on all four sides,[1] according to the finds and the inspired restoration by Th. Wiegand and others.

Note 1. See Die archaische Porosarchitektur der Akropolis zu Athen by Th. Wiegand and Dörpfeld, Gillieron, Schrader, W Watzinger & Wilberg. Cassel & Leipzig. 1904. The fragments of the longer side determine the construction without columns,

the angle triglyph is assumed, as well as the inclined pediment cornice with its incised colored ornamentation, the horizontal cornice with mutules, drops and vias, with the corresponding angle block, triglyphs and metopes are further assured by 158 fragments of the columns between the antes, two larger fragments of the capitals are determined, as well as some pieces of the architrave, which still exhibit taenia and regulas.

Wooden ceilings over the enclosing portico and over the cell, in this being small stone columns set on each other, as well as the wooden gable roof with a covering of tiles was retained for the stone temples as traditional, and indeed in exactly the same form, as it was constructed at a smaller scale in the preceding wooden temples -- enclosed, timbers crossing each other at right angles with smaller beams laid on them and covering boards as a termination of the resulting rectangle between the horizontal beams.

If other forms appear in the stone ceilings of the surrounding portico, they are made possible by the nature of the material; but they properly always reproduce the coffered wooden ceiling! Therefore we shall not err, if we assume as possible substantially a faithful imitation of a preceding wooden architecture. A construction in the sense of Egyptian stone construction (kat'egochen) is to be rejected for the Grecian temple. Supports, cell walls, entablatures of the enclosing porcos, and in part their ceilings are their parts, that have b become stone, as well as the supports of the internal architecture, and there have remained in wood only the ceiling of the cell and the framework of the roof in all periods.

The mixed mode of construction in wood and stone is and remains the criterion for the temple of the historical period, that became stable from the 7 th century onward. Peculiar m must always remain the mode of transition, especially where it relates to great structures, if the same elements are transferred from small ornamental architecture into the colossal.

In wooden construction the natural peculiarities of the materials, their advantages and defects, that consist in easy

working, in "quillen", warping, shrinking and cracking, require too small sections for the structural elements; but on t the contrary, stone construction demands large dimensions, especially if it relates to the use of the not very hard and firm or easily crushed stones. (Porous limestone and sandstone in in contrast with dense and crysaalline limestone or granite; see Fig. 361, the rebuilt stone columns of the Heraion at Olympia).

Wood excludes tall supports on account of flexure, or it p permits them only with the use of tension bands, -- on the contrary stone makes possible such without additions. The stones employed on the oldest ashlar monuments are easily wrought, porous, splitting when wet, that only later must give place to dense stones, worked with difficulty or only with iron tools. The oldest stone temples, both in the mother country (Corinth), as well as in the colonies (Tarentum, Syracuse, Selinus and metapontum) are characterized by "overpowering Doric heaviness and superfluous strength", that of the best period and the Ionic, which are almost always built of the best dense and crystalline limestone,-- by the elegance and greater slenderness of the supports and by lighter entablatures, recalling the Persian porticos. The quality of the material produced this change, from which the masters of the tombs in Mycenae already knew how to derive advantage by their slender columns.

Thus must be explained the abrupt change in the proportions of the structural members in form and magnitude between the preceding wooden construction and the oldest stone construction, that was again corrected in the later noble structures.

Since the Doric cornice assumes the existence of a strong roof framework with terra cotta tiles, and the Ionic a flat terrace roof of earth or clay on a closed wooden basis, there were smaller sections of the timbers for the Ionic order in contrast to the Doric, and if there appeared as basal motives for the form of the capitals of wooden Doric free supports, knots or corbels cut in parabolas at the ends, or pear-shaped turned knobs, then the like results for the Ionic, but with changed terminal forms of the corbels with scrolled endings--

horizontally projecting volutes, receiving a load"."As for t the capital, it is nothing more than a cap-piece, that supports the architrave and receives the upper end of the post serving as a column," says Choisy on this point.(P. 339).

We have explained the wooden antes for airdried brick construction as simple protections for this sort of masonry at t the free ends of walls, as well as similar precautions at openings for passage, thus at doorways, were necessary for the same reasons, and which then further had to form the jambs f for the door leaves. They were superfluous for structural reasons, but for reasons of form, as designating the ending of a wall, they were continued in stone construction.

The "base blocks"or plinth slabs set vertically on the exterior of the cell walls are explained as reminiscences of the ancient brick walls imported from the East, and which may be possible. Structurally, they have no meaning in airdried brick construction nor in ashlar construction; for in the former they are merely a protection against weather, and in the latter are merely a bad arrangement! (Also see further the Phoenician stone buildings; Fig. 17).

Since as already stated, a perfected stone construction, b both in structural and in ornamental respects, is proved in the Peloponessus by the still existing tombs, gateways and masonry structures in Mycenae, Tiryns and other places, already known before the Trojan war (1194-1184) and the immigrating Dorians under Oxylos, and indeed also current, then must have been for these immigrants not difficult the transition from a pure wooden style to a stone style.

"In fact stone architecture also proceeded from the southeast angle of the Mediterranean Sea, and like wine and oil, spread step by step over the coasts and peninsulas of southern Europe and from thence over the civilized world. Phoenicians in the primeval period had taught to the Greeks the art of masonry and terra cotta construction, Greeks brought them later to the Etruscans and Latins, and from Italy they came in a v very late age to the peoples beyond the Alps."(See Victor Hehn. p. 117).

II. The Temples constructed fo stone and wood comprise t

the greatest number of the monuments, that have remained to us.

a. In regard to the materials of the stone temple Pausanias states, that the portico (then roofless and fallen) of Kotys in Epidauros was built of unburnt bricks, and further a little Chapel of Asclepios in Panopeus in the Phocian country, and the neighboring Temple in Stiris -- cities that possessed neither market, gymnasium, theatre and no water, where men dwelt in low tents, like mountain cabins on a torrent. We also mention here a part of the walls of Troy (Hissarlik) and the cell walls of the Heraion at Olympia, probably built of air dried bricks.

b. Constructed of burned bricks were then the ancient Temple of Apollo in Megara (later rebuilt in marble by Hadrian), a Temple of Proserpine near Argos, and the said Philippeion in olympia, whose cell walls appear as poros masonry, according to the German excavations, which is still covered by a red plaster coating. The premycenean buildings in Gournia exhibit brick walls with lime mortar already in 1800 B.C., as previously represented.

c. Of natural and early wrought stones without the aid of mortar, even in the foundations, but joined together by metal cramps and dowells, with careful dressing of the beds and surfaces and a rational stone bond, are to be mentioned as the oldest temples of the Doric style the poros (limestone) Temple on the Acropolis of Athens; the ancient, and the new Hekatompedon built anew by Pisastratos.

Here as in all succeeding buildings of the historical style is expressed the structural principle in the supports and beams; they fulfil a purpose, and only with the capital begins the play of ornamentation, that further appears in the metopes not required for work.

The entablature receives the again actual roof structure, which is composed of plates, pairs of rafters and purlins combined in triangular form, closed by a gable wall at each end of the structure. The space within the triangle affords a further field for ornamentation, where the architect has then foreseen a richer figure decoration. Neither this as the or-

ornament on the columns nor in the frieze obscures the structural ieda; --"the same esthetic truth", that characterizes the structural part of the style, is also expressed in the ornamentation.(See Zielinski. p. 98).

The gentle and art-loving Pisastratos appeared as the leading personage at Athens in 561-528 B.C., and as the time before his political activity is to be placed the building of the older Hekatompedon. As a Doric ante temple of 40.25 ft. facade with triglyph frieze and figure groups in the tympanums (Fig. 362), according to the finds it was built of a hard reddish-yellow limestone, whose remains exhibit a coating of white plastering and a connection of the stones by means of bronze cramps 8 ins. long and set in cast lead. The corresponding figure groupsrepresent Typhon and the great Triton w wrestling, with Hercules on a base slab 0.72 ft. higher, with a strong coloring of all parts. [1] The architrave is covered with fine white stucce, the triglyphs are painted blackish (blue-black ?), the metopes of marble or of limestone covered by marble slabs, the cornice being stuccoed white with incised and variously colored line ornaments, the three astragals and the annulets of the echinus capital colored red, producing a polychromatic architecture on a white ground, in which the different materials are united in harmony by the light stucco coating.

Note 1. The base slab inserted above the cornice is also found again on the Temple of Concordia at Akragas, certainly very much later, and still in place.(Fig. 164; perspective view made by the author in 1890).

"A massive architrave resting on white columns and with a red band interrupted by blackish regulas, above which were blackish triglyphs between white metopes, the whole shadowed by a blackish cornice with red facia, over which spreads the brightly colored lotus ornamentation of the cyma. Added thereto are the scrolled white acroterias of the facade and the fanciful idea of enhancing the appearance of the tympanum by painting the underside of the inclined cornice slabs with great flying birds and extended flower compositions". -- "
"Such a building could not lack effect on a people, whose taste, as shown by the glaring sculpture of the pediment, was

still unaffected by the influence of the refined Ionic marble sculptures". By these two expressions, Th. Wiegand characterizes this archaic building.

Esthetically richer in form is treated the peripteral structure of Pisastratos of 6 × 12 columns succeeding this ante t temple. Its foundations consist of hard reddish-gray limestone from Hymettos and of bluish limestone, while the columns, architraves, triglyphs and cornice are of poros (Piraeus limestone, a porous freshwater limestone of a yellowish or whitish color), that was covered by very fine stucco. Metopes, pediment cornices and sculptures, cyma and roof tiles were made of white coarse-grained marble, and the upper portions of the cell walls were entirely constructed of poros.

The stylobate of the surrounding portico consisted of a single ashlar step, the columns were made of drums of varied heights, joined together by square wooden dowells. The architrave was composed of two slabs set on edge beside each other, connected together by H champs. The shafts of the columns were covered by 20 flutes, their diameter being taken at 5.41 to 4.26 ft. Their height has remained indeterminate; on the contrary, the strongly projecting capitals are assured with four annulets and four incisions at the necking, as well as the painting of the cyma. In the pediment groups the nude was not colored,"the gleaming color of the marble would have its effect", they substantially stood in white against a dark, indeed a blue background.

Indeed for the same period date the remains of five smaller poros buildings on the said Acropolis, on which mutules of varied widths and with but two rows of drops , cornices with only four and five drops, painted ante capitals and twisted poros columns (published by me in 1892) were found, with a strongly projecting echinus, three annulets and four necking incisions. The latter were indeed of the same age as the ancient Temple of Athena and are not to be regarded as supporting columns in a structure, but rather as supporters of consecrated gifts.

The equalizing marble block for those is also to be mentioned, as well as the corresponding variegated terra cotta cymas and antefixas. Poros structures of the Ionic style have not

been found, since this appeared later from the East in the sequence of the use of marble. (See Th. Wiegand. p. 232, 233).

The greatest and most fortunate period, Corinth recorded under the tyrants (652-582 B.C.), and in this must be placed the erection of the great Doric Temple. Formerly a peripteral structure with 6 × 15 columns, those of the facade having larger diameters than those of the sides. (5.64 to 5.41 ft.).Seven of these yet stand, connected by architraves 12.53 ft.long, that still exhibit the taenia and regulas. The capitals project strongly, have a thin abacus, three annulets without coves and three incisions at the necking. The shafts exhibit 20 flutes, are slightly diminished and have no entasis. Built of poros limestone, the surfaces have a yellowish-red coating of stucco.

It belongs to the heaviest of all Grecian temples.

With similar heavy proportions is the very archaic Temple in Tarentum, that may be placed in the first half of the 6 th century. The columns were originally 27.78 ft. high, with lower diameters of 6.23 ft. and upper ones of 5.08 ft., spaced 12.20 ft. between centres, and having 24 flutes. The abacuses leave between them a space of but 3.35 ft.

To the same early period -- end of the 7 th or beginning of the 6 th century -- may be referred the Olympeion in Syracuse,[1] of which there are now but two monolithic columns with 16 flutes, which start from a plain band above the stylobate. Of this were found painted terra cotta coverings on the cornice and the cyma, that were necessary for the coarse and porous shell limestone.

Note 1. See Paoli Orsi. L'Olympeion di Siracusa. Monumenti antichi. Rome. 1903.

The massive remains of the very ancient hexastyle Doric peripteral structure with a builder's inscription on the stylobate -- the Temple of Apollo on Ortygia (Syracuse) -- must be placed here. Cavallari-Holm would even refer the building back to the 8 th century B.C.; on the contrary, the character of the letters on the stylobate indicates the 6 th century B. C. Likewise a great Doric peripteral structure with properly 6 × 17 monolithic columns (Fig. 146), it shows these so closely spaced, that their lower diameters are greater than the d

distances between the columns, whereas the intercolumniations vary so much, that they afford the most diverse suggestions for solving the question of the treatment of the triglyph frieze, if indeed this existed. There was neither found of this nor of the cornice more than a little piece, but on the contrary a plain architrave block still rests on the columns, crowned by a chamfered taenia, but without regulas and drops! Fig. **146** shows the possibilities of the arrangement of the triglyphs, of which that with the elongated metopes is the least probable.

R. Koldewey and O. Puchstein (p. 85) place in the 6 th century B.C. the temples in the Achaian colonies, especially the most ancient in Metapontum and in Paestum. At the place first named are the so-called Tavole Paladine and the Temple of Apollo (Chiesa di Sansone), in the latter being the so-called Basilica -- the archaic enneastyle building and the so-called Temple of Demeter, the archaic hexastyle building.

Of the Temple outside Metapontum (Tavole Paladini), the plan has not been fully uncovered, yet 10 columns still stand on the western facade and 5 on the eastern side, with axial distances of 8.82 to 8.88 ft. Twenty flutes cover the shafts of the columns, which are coursed in drums of unequal heights, and their entasis is small, but perceptible. The architrave is only preserved in its lower course, as well as the triglyph frieze and cornice. Whether the upper course consisted of a taenia with regulas and drops or a cymatium is uncertain. The cornice with mutules is made probable. Painted terra cottas from the ceiling and roof were already discowered by Duc de Luynes.

The Temple of Apollo is worse preserved than the preceding. But little is now to be seen of the foundations, and no stone of the superstructure rises above the ground. Judging from the middle foundations, we have to do with a two-aisled cell. The columns have 20 flutes, and the capital recalls that of the Grecian Temple at Pompeii. Remains of stucco on the stone fragments frequently remain, on one ewen being four over each other, that were successively applied on the poros limestone. Cramps in H form are found; the upper course of the architrave

must be assumed to be a Lesbian cyma, as in Paestum,-- "according to the representations, that we have obtained from the Achain Dorism". The triglyphs are of peculiar shape; varicolored terra cottas, that were employed on the ceiling and roof, have been found in great numbers, even with the copper nails by which they were fastende. Koldewey and Puchstein (p. 40) mention these and state; already had Durm (Baustile I, p. 129) said, "that the mode of fastening these coverings on woodwork has been made clear by the piece in Metapontum. The numerous still existing terra cotta boxes, decorated by reliefs and painting, are 1.10 ft. high and exhibit square holes in the sides, through which copper (not bronze) nails were driven into the woodwork to be covered. Bent copper nails yet remain in some holes. A great number of such, that accurately fit in the holes, were preserved in the glass cases of the so-called Museum in Metapontum, and they are now in the prehistoric division of the Museum in Naples; they all measure 5.12 ins. in length, are square with square heads. Metal, form and size of the nails leave the former fastening in wood without doubt; likewise the fact, that the terra cottas nowhere have traces of mortar on the backs, but show the entirely clean terra cotta surface, then decide that these were only employed on wood", - - - "but meantime it is also our opinion (Koldewen and Puchstein), that the boxes come from the covering of the beams of the portico ceiling. One must not then exclusively place in the same category of terra cotta coverings so commonly found, as Dörpfeld and his associates have done, and the assumed cornice coverings are limited to the very archaic period of the Doric style".

If the widely distributed "cake-like" Doric capitals in Tarentum, Syracuse and Metapontum, as well as those in the mother country at Athens, Delphi and Corinth, be assumed as characteristic of the first period of the origin of the stone temple, then is the existing stone structure of the Heraion at Olympia also to be placed in that period.

The similarly shaped column capital should be assumed as t the oldest made for the building among the different types t there found, and the age of the Temple be determined accord-

accordingly. On the shafts of the columns of unequal diameters the number of flutes is 20, but only 16 on one of these. The architrave, frieze and cornice are entirely wanting. The building material consists of a coarse conglomerate; the stonework was covered by a stucco coating, and the roof with terra cotta tiles. [1] Two of the ancient fallen stone columns have been again rebuilt by the means of a German gentleman, and thus give a better conception of their esthetic effect. (Fig. 361).

Note 1. See olympia, the results of excavations instituted by the German empire, edited by E. Curtius and F. Adler. Berlin. 1892. Vols. 1 and 2 of plates. Gable acroterias of painted terra cotta 8.69 ft. diameter, antefixas, covering plates, drip plates; Paltes 115, 116. Vol. 2. Other cornices, antefixas, drip tiles with water spouts, cymas etc., represented on Plates 118, 119, 120, 122 and 123 -- all in vol. 2.

Of the Temples at Paestum, the archaic enneastyle building (Basilica) and the hexastyle structure (Temple of Demeter) a are to be placed here, "as examples of the variety and freedom of the Doric style in the 6 th century B.C." As the older of the two may pass the Temple with 9 × 18 columns with a two-aisled cell, which rises on a substructure of two steps and a stylobate course, with a height of 1.23 ft. (See Koldewey-Puchstein. plate 2).

Dovetail cramps on the corner blocks of the stylobate and a lack of all visible curvature of the steps are proved, as one such at the Heraion appears to have been merely caused by sinking. The columns are 4.79 ft. diameter and have 20 flutes on strongly diminished shafts with entasis, that are built of drums of unequal heights. It is there notable, that for some capitals of columns the abacus is of ordinary hard limestone, the echinus entirely of marble, and the astragal is of soft sandstone, an alternation in material, that is also carried out in other structural parts of the two temples. The soft sandstone throughout suffered more from weathering than the hard travertine, but this indeed only occurred when the temple had lost its equalizing and protecting stucco coating. It is to be mentioned as a peculiarity, that the leaves of

the capital terminate within the hollow and exhibit on the e echinus a round between two astragals, or beneath the hollow have a round, leaves freely recurved, on the echinus being a band with lotus leaves, rosettes or interwoven bands.

The architrave consists of two parts in height, the upper one being of soft sandstone and moulded on both sides, thus lacking the regulas with drops.(Fig. 139, and Fig. 10, p. 15 in Koldewey and Puchstein). Of the frieze, only the inner and entirely plain course remains in some places. How the cornice was treated, whether with an arrangement of mutules and vias or with a coffered slab, as on the Temple of Demeter, must now remain indeterminate. Peculiar is also the ante of square section with the strongly projecting cavetto capital, which with great diminution and entasis on all four sides is designated by Puchstein (p. 16) "as a faithful translation of the column to a square plan". Raised surfaces on the abacuses and hook cramps occur there. On the stylobate, plinth slabs again stand on edge, succeeded by the ashlars of the cell. Pediment and roof are gone, yet terra cotta remains of the latter occur. Of arrangements for raising, there may be seen the U-shaped rope grooves on the end surfaces. Besides the hook cramps of the antes are to be mentioned the axe cramps on the northwest angle and the decorated cramps on three other corners of the stylobate.(Fig. 103 and p. 15 in Puchstein). The sinking on the end surfaces of the ashlars of the stylobate has broad margins and is triangular and not very deep.

The ancient hexastyle building with 6 × 13 columns on a stylobate of 2 steps is "technically and in form a distinct advance,"-- of which there yet stands the pediment and beneath this a part of the frieze, cornice and architrave, the columns and the stylobate. The mode of coursing in this part is given in Fig. 25, after the representation by Puchstein and the dimensions of Labrouste. The columns stand at 8.66 to 8.54 ft. between centres, and show the type of the before mentioned Basilica, with the strongly diminished shaft with slight entasis, 20 flutes and a swelled capital deeply undercut at the hollow. On the architrave the upper member is again made of sandstone as a cyma on both sides; the frieze has singularly

inserted triglyph slabs, recalling the construction of the ancient Hekatompedon in Athens, whereby with the thoughtful stonecutting of the architrave and frieze, with unequal dimensions in height, the weight of these and of the tympanum wall is transferred in the best way to the supports, without loading the architrave too much. The construction is original and well considered, but not without later correction. The triglyphs are made of a softer kind of stone. The cornice is in the form of coffered slabs with stepped sinkings and yet partly remains in place above the tympanum, and it was proved to be of the same form on the longer sides by the finding of a pediment angle block by Koldewen-Puchstein.(Fig. 22 in their work). The gains for the places of the ridge and intermediate purlins of the roof may still be recognized, as well as axe cramps and dowell holes. The sinkings in the joint planes have broad margins and moderate depth. The great difference of 0.89 ft. in the dimensions of the eight angle metopes in contrast to the normal (2.79 to 3.68 ft.) suggests an intentional ignoring of the necessity of a possible uniformity of the metopes on the part of the architect. "Every axial difference is to be avoided on principle, and absolute axial uniformity on all sides is to be produced." An axial position of t the angle triglyph with a half metope, as Delagardette still represents, is to be avoided.

Archaic Dorism in its last phase just before the best period is shown by the Greek Temple in Pompeii, [1] of whose early Grecian stylobate only a small block now lies beneath the two drums of columns in place on the north side. The upper step is almost entirely wanting' only on the northeast angle still lie some of its ashlars. The sinking of the beds is deep and with broad margins. The two drums of columns still standing have 18 flutes, roughed out in the surface and once covered by stucco, consisting of a lower course and of a polished coarse-grained upper course of stucco marble. The four remaining capitals are of Sarno limestone, recalling in their forms those of the Tavole Paladini at Metapontum, their surfaces being likewise roughed to receive stucco. The measurable axial distances give a distance of 8.33 ft. without any re-

reduction for the angle spaces. Otherwise some valuable brightly painted terra cottas from the roof were found -- pieces of the cyma with unperforated lions' heads and anthemion ornament.

Note 1. Se F. von Duhn & L. Jacobi. Der Griechische Tempel in Pompeii. Heidelberg. 1890.

Of the group of temples in the Doric colonies, according to those mentioned at Tarentum, Syracuse, Metapontum, Paestum and Pompeii, it is especially those of **Selinus** on which men are agreed as to their chronology on account of the accurate work of Otto Benndorf, so far as this concerns the peripteral temples built before 409 B.C.

From a very ancient time dates Temple C, after this being Temple D, somewhat later Temple F, and finally Temple G, that was at least begun in this period.

But still absolutely accurate dates for the erection of the temples mentioned are not fixed, or still only on the basis of the date for the founding of Selinus, i.e., 628 B.C. The oldest of the said temples we must indeed place at the middle of the 6 th century, in the time of the greatest activity in stone construction.

Temple C, a peripteral structure of 6 × 17 columns and with a very long and narrow cell was the most important one on the acropolis. The spacings on the longer side are equal and average 12.66 ft., those of the facade being 14.46 ft. on the other hand. The six columns of the eastern facade and the adjacent eight on the southern side are monolithic, the others being composed of drums of unequal heights. Most have 16 flutes, others 20, that end in the hollow of the capital, but which were also extended in stucco through this to the annulets, of which another example remains on the Temple of Hercules in Akragas; their diminution is moderate, and an entasis does not exist. The material as well as for the entablature consists of fine limestone tufa, which was quarried a few miles north of Selinus.

Guiding dowells for the drums are proved.

On the architrave the strongly projecting taenia bears in the middle of the front surface a flat sunken round and a low regula with inclined face, on which are 6 free drops. On the

architrave are also found on its face the remains of stucco. The grooves of the triglyphs are bordered, and according to Koldewey-Puchstein (Fig. 74), with reference to the angle triglyph exhibited in the Museum at Palermo, they end in found form and deeply undercut. The band enclosing the incisions follows the semicircular form on one side of the triglyphs, while on the other side it is round inside and externally an ogee curve. The limestone employed exhibits a porous surface; the edges are partly broken and destroyed. This fact must have led Cavallari to the "representation of the pointed arch" (Fig. 363). But what Puchstein gives as a pointed arch is an ogee or recurved arch. The form of the pointed arch would in itself be no rarity. My own observations would lead to the recurved arch as the cut form. What the stucco-worker finally made of it,we do not know. In any case the ending now shown is not the final word and at the same time is without meaning.

The equality of the axial divisions influenced uniformity in the subdivision of the triglyph frieze; the mutule cornice exhibits narrow mutules with 3 × 3 drops and wider ones over the triglyphs with 3 × 6 drops. Above these was further placed an ashlar course, that was covered by terra cotta boxes and extended horizontally around the entire building, while a simple undercut course, likewise with terra cotta slabs, that again projected 1.51 ft. beyond the tympanum, formed the pediment cornice, whose front surface was about 1.57 ft. high, in agreement with the horizontal cornice on the pediment.Thus the terra cottas were lower on the pediment than at the sides, and the pediment cornice had the same bend, that the Temple of Demeter at Paestum makes credible, and which also occurs on some Phrygian rock-cut tomb facades of the ancient native style. Over the inclined cornice must have been a complete cyma. The sinking at the joints is round and sharp edged; d dowells and cramps do not occur on the building, and for setting arrangements is only the provision of a double groove for a rope on the end surfaces and beds. For the restoration attempted by Koldewey-Puchstein (Fig. 178 in their work), a part of which is given in Fig. 363, it may be repeated, that

from a technical standpoint the attempt must be termed a failure, and that nothing requires its acceptance. Starting points for it nowhere exist, the block a b c d e must first be found, and likewise the triangular piece e f g, that further in the chosen arrangement would project beyond the smooth frieze band slab by the thickness of the moulding.(Fig. 365).

Temple D was a great ancient Doric peripteral structure with 6 × 13 columns on a stylobate of 4 steps, with axial distances of 14.33 ft. on the facade and of 14.30 ft. on the side. The shafts of the columns consist of drums of unequal heights and have 20 flutes, those of the columns of the pronaos on t the contrary having but 16 with moderate diminution and slight entasis. The surfaces of the stones were covered with stucco. The flutes were intersected by the hollow of the capital. The drops of the regula hung free; the front surface of the architrave was likewise covered by stucco, just as the metopes also exhibit a white coating of stucco.

The triglyphs are as wide as the metopes, so that the difficulty of the triglyph at the corner is avoided. The cornice bears narrow and wide mutules, like Temple C. The inclined cornice is undercut plane and is recessed four times, the innermost band abuts against a second.

According to the fragments found and the remains of color on both temples C and D, Puchstein comes to the conclusion (p. 109), "that on these ancient buildings the white stucco was employed only on those parts, which were not painted, and thus chiefly on the larger surfaces of the architrave, metopes, and the like". And on the shafts of the columns, the capitals and the cell walls should be added. The roof appears to have been covered with tiles of fine limestone with square edges. Instead of the antes usual elsewhere, we find columns in the pronaos.

Temple F in Selinus was a great ancient Doric peripteral b building with 6 × 14 columns, with stone enclosures between them, and built on a stylobate of 3 steps. Remains of stucco and of color are also discerned here. The shafts are made of unequal drums and with strong diminution, but remained without entasis. Twenty flutes surround the shaft and terminate in

the necking hollow of the capital. The capital has a low abacus, a flat and slightly swelled echinus with 4 annulets, the architrave a taenia with free drops from it. Most of the metopes, even those sculptured, are of two courses in height.

The cornice throughout has mutules of equal widths, that have 6 drops in front and 4 in depth. On the corona is found a groove for the cymatium, which is made of fine white stone in the simple Doric ogee form and bears traces of painted leaves; its top along the sides is wrought to the slope of the roof.

Of the remains of stucco and color, there are still remaining red colors on the cornice, applied directly on the stone; between the mutules and on the face of the scotia is to be m mentioned white stucco on the corona and the under surface of the scotia, on the architrave, on the capital and on the columns.

On the internal columns were traced 16 flutes, but not executed. Painted fragments of terra cotta from the roof were found; in the Museum at Palermo are to be found portions of the beautiful cyma of fine tufa belonging here, decorated by ornaments and colors.

The sinkings on all ashlars are bold and with wide margins, extending also on those of the longer sides. Dowells were n not found, and only axe-shaped cramps at the intercolumniations.

Templ G of Apollo in Selinus was of colossal dimensions, aside from the Temple of Zeus in Akragas and the Didymaeon near Miletus, being the largest in antiquity. The date of its erection is placed at the middle of the 5 th century B.C. From the axial distances, Koldewey-Puchstein reckon a width of 164.33 ft. with a length of 361.98 ft., assuming a so-called pseudodipteral structure of 8 × 17 columns with 3-aisled cell, in whose middle aisle was constructed a so-called adyton.(Fig. 365, plan).

Three doorways led into the three aisles of the cell, their columns considerably smaller, monolithic and without flutes, in contrast to the external columns; they bore the capital w with a hollow, finished for 16 flutes. A smaller capital was found and leads to the inference of a colonnade above the low-

lower one. [1]

Note 1. Hittorf in his magnificent work (Architecture Antique de la Sicile. Pl. 70-74. Paris. 1870) attempts a restoration for the interior with 2 and 3 colonnades over each other; once assuming a skylight in the manner of the atrium of the antique dwelling, and the other time he prefers high side light beneath a hypaethrum, thus erecting anothe small colonade above the middle aisle, which supports an internal roof. Both assumptions are more interesting than fortunate.

Differing from the archaic architecture is that of the opisthodome. That of the former exhibits archaic swelled capitals with hollows and separate forms of antes, those of the latter being fully developed stone capitals without hollows and regular Doric antes -- so that the eastern part is built in the ancient archaic style, the western facade being in the fully developed Doric, whereon many parts have not passed beyond the stage of preliminary work. A completely fluted column in the east has a diameter of 8.53 ft.,a polygonal one in the west having one of 11.48 ft. on the other hand, which thus produces a difference of 2.62 to 2.79 ft. from each other. From the diversity of the capitals, three types come under consideration, which A. Holm determined for the first time. (1871),(Koldewey and Puchstein, p. 124) with axial divisions on the facades and sides of 21.39 and 21.72 ft.

The triglyphs were wrought in one piece and have two rope grooves on the underside; the metopes consist of one large 1 lower and two smaller upper blocks with a simple band cap. Massive blocks 9.84 ft. deep form the cornice, that has uniform mutules with 3 × 6 drops. The use of axe cramps (double dovetail) is established. The height of the columns for the peripteral colonnade is assumed by Hittorf at 53.47 ft. and by Serra di Falco at even 56.94 ft. Koldewey-Puchstein are contented with a height of 53.37 ft. for axial distances of 21.39 and 21.72 ft., when they fix 21.65 ft. as the total height of the entablature.

We here have a procedure similar to that at the Heraion at Olympia, where with columns of uniform height the diameters of the columns differ strikingly, as well as the profiles of

the capitals. In such great undertakings and especially for those of long duration, men have not hesitated to make concessions to a changed taste -- the new fashion -- and undisturbed by the appearance of that already executed, have placed themselves on the standpoint:-- "We do this better today and will not be archaic in a dull way." Did not in our mediaeval cathedrals the Gothic and the Romanesque proceed in the same manner, and even the Renaissance in its last phases, with the two preceding styles?

All columns with the oldest forms of capitals indeed belong to the pronaos facade (except that for two in the series the capitals could no longer be found), the same capitals on corresponding shafts were borne by the columns of the entire right side and of about one half the left side, the remainder of which, including the angle column of the opisthodome facade, bear the capital designated as the middle form, while the others and the two capitals of the opisthodome exhibit the modern form. Thus only the pronaos facade and the right side were uniformly executed in accordance with the old canon, the left side had half its columns according to the older and half after the middle canon, those of the opisthodome facade being after the modern, where the two angle capitals are further designated as no longer to be determined. And that must be taken with the colossal building!

With the deep pronaos, a single middle doorway did not suffice to light the interior, even if this be assumed to be 13.12 ft. wide and 52.16 ft. high; the architect then added two others, somewhat smaller for the side aisles, whereby indeed a hypaethrum became superfluous.

The archaic Doric peripteral Temple on the Aeolic coast, that by J. Th. Clarke [1] is dated 479 B.C., contrary to the e earlier assumptions, likewise exhibits a certain uncertainty in the detail forms, like the before mentioned temples at Paestum and Metapontum, with many others. First is to be reckoned first in this case is the architrave, sculptured with figures, on which the regulas of the frieze are without drops, as well as the mutules of the cornice, which are likewise left without drops.

Note 1. See Report of Investigations at Assos in 1881. Boston. 1882. p. 215. pl. 8; Also (Fig. 358). F. Adler. Die Ausgrabungen in Assos. Berlin. 1882.

According to the statements of Texier, an increased arrangement of steps is carried across the facade with a peripteral portico of 6 × 13 columns, that are spaced 7.22 and 8.03 ft. between centres with a height of 15.42 ft. The shaft is surrounded by 16 flutes, the material employed consists of volcanic stone, a trachyte of dark color, that indeed was covered by stucco;

Contrary to Texier's plan, the temple is now represented, when measured on the upper step, as a plain ante-temple 46.91 ft. wide and 99.48 ft. cong with peripteral colonnades (allied to the middle city Temple in Selinus). The ashlars of the lower steps still have the setting bosses, the cornice blocks have U-shaped grooves for the hoisting ropes, and also iron clamp-bands; the drums of the columns, as well as the joint surfaces of the ashlars, are wrought with borders. Both the plain and the sculptured metopes were inserted in grooves in the triglyphs. The covering tiles were of terra cotta. The recently found sculptures of the entablature are now exhibited in the Museum in Constantinople; others are in the Louvre in Paris.

The Doric stone temples from the beginning of the 6 th century to the works of the best period in Athens, mentioned under II, both in the mother country and in the colonies, are not all of the same material, even in the same building, like the poros architecture on the Acropolis of Athens, and as shown by the Temple of Apollo at Delphi, built by Trophonios and Agandes in 530-514 B.C.(which was described by Pausanios as completed in 330 B.C., after the ancient one was destroyed in 373 by an earthquake. Painted remains thereof in Parian marble were found in the French excavations built into the foundation), the Heraion at Olympia, the two archaic temples at Paestum, Metapontum and others.

Where uniform materials came into use, we see porous shell limestone, travertine, and also trachyte, taken from the immediate vicinity of the building, employed for building purpo-

purposes, thus for the Temple in Corinth, , together with the Achaian, Chilcidic and Doric colonies in Sicily and lower Italy (Tarentum, Syracuse, Metapontum, Pasetum, Selinus, Akragas, Egesta, etc.). All these temples without distinction were covered by more or less fine stucco marble and painted, then the structural elements are mostly left white, the ornaments and figuees bēing in the well known heraldic colors, blue, y yellow, red, green and black; the figures rose in light colors from a dark ground (red or blue). The entire stone construction disappeared, even the most careful fitting of the joints etc., together with many failed experiments in stonecutting, like the irregular and unequal heights of the drums of columns, beneath the concealing coating of stucco and color.

Likewise appearing imperfect to us many details, annulets, cymas, fillets between flutes, incisions and the like, were refined and shaped by stucco as done today, frequently being merely the preparation for a finely conceived artistic form, and they must be judged in this sense. By the coating of stucco and color also disappeared the different materials employed on the same building; for this was only possible a uniform tone effect of the architecture.

That with this mode of construction -- ashlar work with a coating of colored stucco -- repairs or restorations were frequently necessary on the exterior, especially for exposed portions of buildings, as for example on eave cornices, that had to resist the entire effect of weather, over which the rainwAter flowed, indeed requires no further statement. This evil was palliated by the use of weather resisting arrangements f for protection, painted and hard burned terra cotta boxes and plates on the porous stone cornices and the wooden beams of the portico ceiling. In place of the perishable material appeared a more monumental one -- burned clay -- that always tells us what the crystalline limestone and other dense kinds of stone had long refused to do. On the Treasury of the Geloans at Olympia, on the two archaic temples at Metapontum, on the temples at Selinus, they are proved and have remained to us, fastened on the stone cornices and wooden beams by metal pins and long copper nails. With the variegated clay tile

roof and its acroterias, antefixas, ridge and eave tiles, they form a criterion of the buildings of this period.

The ruins are now mostly tinted a golden brown in quiet and simple grandeur, animating the landscape in a passive way, or prominent in the midst of modern everyday life and among its art and industrial structures, they affect the nerves of the northern observer of today differently, and influence sentimental natures more strongly indeed, than the formerly gayly stuccoed sanctuaries would do, that reflect joy in color of of the eastern nations. The rebuilt angle of the Temple of Castor and Pollux near Akragas with its colored stucco covering challenges reflection -- The conceptions of the "beautiful" are even subject to change!

Further characteristics of the temples of the 6 th century are yet to be found in the frequently monolithic and heavy shafts of columns, constructed without entasis, in their widely projecting "cake-like"echinus capitals with the intermediate plain or leaf-adorned hollow at the transition from echinus to the shaft of the column, in the flutes of the shaft n not always carried to the stylobate, after the Egyptian prototype (which further occurs but occasionally), whose number varies from 16 to 24, in the absolute verticality of the colunms, in the partly occurring and reduced stylobate; then in the p placing of sculptures in relief on the face of the architrave, in the uncertainty of form and number of drops on the regulas and the mutules, as well as in the inequality of the latter, -- wide and narrow alternating -- from 4 to 6 on the former, on the latter frequently but two rows in depth, or even the complete absence of the mutules and vias.

As a peculiarity or an uncertainty in this period must also be the omission of the regulas and drops and the plain band (taenia) above the architrave designated generally, as well as their replacement by a cyma with or without additions. Likewise the prominence of the band without drops on the architrave decorated by sculptures is to be placed here. And what must be regarded as more striking is the entire arrangement wholly outside the lines of other early Grecian structures, the occurrence of the coffered pediment and eave cornice slabs,

with the bent pediment cornice.

Likewise in technics is also a touch to be noted, especially in the mode of preparing the end and bed surfaces of ashlars and drums of columns, then in the contact of these and their direct connection by wooden or metal cramps in detail, Z and U cramps, also of axe-shaped and ornamental forms, for which bronze was employed in the earliest period, but then in the later, almost without exception, iron with cast lead.

The arrangements for hoisting and setting by means of U-shaped grooves in the ends of the ashlars and of all parts of t the entablature (architrave, frieze and cornice), the cutting of straight grooves in the ends and beds of different ashlars, their perforation for slinging on ropes, are characteristic arrangements of the period, of which the U-shaped groove on the end surfaces of great ashlars was indeed learned from the Phoenicians.(See the Phoenician royal tombs in Sidon).

The last step in dressing and smoothing the ashlars occurred after completing their setting, and this was retained later, being set when the roughing was finished and at the commencement of taking down the scaffolding.

Common to all temples is only the coursing of the stones w without any mortar and the use of plinth slabs slightly projecting from the face of the wall, usually forminm a plinth without a moulding.

On the eastern facade of the Temple of Apollo at Delphi was made indeed the first attempt in architecture to apply painting without a plaster ground and directly on the white Parian marble, which first became common with the introduction of white marble for the temples of the mother country, with the aid of gilding.

It must still be emphasized here, that just the temples, w which belong to the oldest architectural works and must stand nearest to a preceding wooden style, relatively least bear v vestiges of a recollection of such. Thus for example, the t two very archaic temples at Metapontum and at Paestum, the Artemesion at Syracuse, the Treasury of the Geloans, the Megaron of Demeter near Gagera, and the Temple in Assos remain free carpenter's means recalling wooden construction for fas-

fastening the grooved facing boards (triglyphs) by bands and drops (wooden pins), that only undiminished and undeniably o occur first in the buildings of the declared Doric style as a fixed form, like the number and shape of the drops on the mutules. The architect of the Temple of Demeter in Paestum went farthest in this, where a direct representation of typical wooden construction in stone is justified in both structural and formal respects, already on account of the coursed stonecutting mentioned for the pediment entablature and the resulting necessity for inserting the triglyphs in the form of slabs.

III. About the middle of the 5 th century was completed a further change, that"created a single, generally current and uniformly developed style", and meantime shows but slight echos of the ancient different forms, with an almost absolute monumentality of the buildings.

It is first compelled by the introduction of a new building material, which with greater durability and strength permits the finest dressing of the ashlars and of the details, making the stucco coating superfluous as a protecting material for the stone and for receiving the painting, likewise terra cotta for the covering of the roof and the woodwork of the ceiling of the principal portico, of the pronaos and of the opisthodome can be omitted, and this be limited to the ceiling of the cell and the roof construction -- this is the dense crystalline limestone, the white marble of Asia Minor, of the Grecian islands, particularly of Paros and from the vast quarry of Pentelecos near Athens. If we place the date of the erection of the Temple of Zeus in Olympia in the year 456 B.C., of the Temple of Poseidon at Paestum in the middle of the 5 th century, that of the Temple of Aphaia on Egina not before the year 500 B.C., the monuments of this nearly perfected stone architectural style are indeed preceded by "great and prominent historical works of the Doric style, which may b serve as examples of the declared and strong architecture of the 5 th century, but in technical perfection and artistic symmetry in form and proportions stand far behind the buildings on the Acropolis of Athens, that are not so very removed

from them in detail.(the Parthenon in 447-438 B.C., the Propleion in 437, the Theseion in 421, the indeed little Ionic T Temple of the wingless goddess (Nike Apteros; 440-410?) and the Erectheion completed in 407 B.C.), and they must remain behing them by the advantage, which there lies in the peculiarity of the building material, that alone made possible the execution of the tolerably wide span stone ceilings over the peripteral and entrance porticos, together with refinements of all kinds in general and in detail.

Other buildings belong to the Doric colonies, like the remains in Himera, in the period in which all uncertainties of the Doric style had almost wholly disappeared, or as in Akragas, in the latest phase of the archaic period (Temple of Hercules of about the end of the 6 th century) and in the best period of the 5 th century B.C. After the mighty victory of Himera (480 B.C.), there were at command for the construction the hands of many thousand captive Carthaginians with such enormous booty, that men might attempt the greatest in temple architecture. This fact, connected with the great political event, indeed permitted the erection of the second colossal temple on Sicilian soil -- the gigantic Olympeion at Akragas, which apparently was not completed at the destruction of the city by the Carthaginians in the year 405 B.C. Other buildings at the place date from the time of its resettlement about 338 B.C., when it passed through a later prosperity.

In the time before the attack by the Carthaginians must also be placed the unfinished Temple in Egesta (430-420, or according to others, 409). In the construction of temples in Sicily and in the colonies in lower Italy, men continued faithful to the natiwe building material, the porous limestone., which likewise applies to a portion of the Peloponessus, where men were satisfied with the ordinary limestone (Egina, Phigaleia), for not everywhere could the means be obtained for the beautiful white marble. But the striving for beautiful proportions and beautiful forms was successfully conducted by the masters, compelled to use the less valuable material, even if they must omit the refinements, that appeared in the Doric buildings in Athens , in the refined manner of diminution and

of the section of the shaft of the column, the enlarging of the angle columns, in the columns of the peripteral portico inclined toward the cell wall, in the pyramidal batter of the cell walls, -- but not in any curvature of the horizontals,-- since they also could not undertake the over fine details,the minute execution, the precious figure decoration of the metopes in marble, the pediment group, the marble ceiling and the marble roof. But they remain therewith no less worthy of esteem!

In the Attic Doric style is spoken the final word of the Doric style of architecture; it exhibits the highest perfection in the conception and form treatment, but it likewise conceals in itself the germs of its destruction. Its characteristic side is comprehensive and its representation is especially prominent as the most important moment of the entire Grecian temple architecture. Its monuments are here treated in advance, in order to not interrupt the sequence in the technical development of the architecture; contemporary works in less valuable materials then follow -- last but not least.

They exhibit the highest perfection of form with well reasoned proportions and moderate dimensions. The columns are m more slender than in the preceding period, with less diminution and an entasis scarcely perceptible to the eye, surrounded by 20 flutes of semi-elliptical section with sharp edges. The echinus is steep, almost a straight line, and the abacus projects but little beyond it; it is surrounded below by 4 annulets; the necking is generally marked by a single incision.

The entablature stands in the most beautiful harmony with the supports bearing it; the cornice projections are bold, the details fine and graceful, partly influenced by Ionic elements. Most of the buildings of this period are constructed of white marble, on which the decorative painting was directly applied. The technics on them are perfected, although here also occur irregularities and inequalities, as in all the products of h human hands. The jointing is always excellent, frequently even invisible, a fact that may be ascribed to the cementing together of the joints in the course of centuries, after the protecting coating of color disappeared, and the surface of

of the crystalline limestone had been eaten away.

The ashlars are mostly held together by iron cramps and dowells set in cast lead, without the use of mortar.

It is not sufficient to assume that the material afforded opportunity for bolder spans of the architrave and wider spacing of the columns, for in no Doric marble monument this exceeded the length of the architraves of the poros temples of the same style. (Compare the Theseion and Parthenon with the temples in Selinus, Egesta and Olympia). Likewise the opinion that marble gave opportunity for finer forms of details is i incorrect, for the same delicacy could be produced in stucco, and as already stated, we judge falsely, if we desire to determine from the preliminary poros profiles of the earlier monuments the greater or lesser refinement of the no longer existing stucco forms, of which these were often but the preliminary rough nucleus. (For example, see on some Sicilian p poros remains the stuccoed rounds, whose nucleus was also not round, but was left three-sided or angular etc.).

To designate poros, i.e., porous limestone, as the Doric building material and to deduce from its peculiarities the c closer spacing of the columns as a compulsory result, and to desire to introduce marble for the possibility and the wish for wider architrave spans is incorrect in view of the existing monuments. On the formal treatment of the facade of the Doric temple marble had scarcely any influence; it merely avoided the otherwise common and less durable stucco coating a and made possible the direct application of color to the building material; its use was in almost all cases compelled by local conditions. Where it lay before the gate, it was employed; where this was not the case, men were satisfied in the best period with other materials.(See Phigaleia). The Greeks of Asia Minor were opposed to the Peloponessians, Sicilians and Italians in respect to the building materials in a much better location; for the given reason could they employ marble earlier and more easily, than those peoples. -- But the new material produced one change in the Doric temple in the ceiling construction; there are the long span beams and the stone coffered ceiling the result of the material. Stone

beams 21.33 ft. long with small sectional dimensions, coffered ceiling slabs 10.50 ft. long and 1.47 ft. thick are to be counted there. The ancient wooden framework covered by terra cotta must yield to the monumental stone ceiling, at least in the portico and in the front and rear vestibules.

As the most notable examples may be mentioned here:--

a. The so-called Temple of Themis at Rhamnus in Attica (6.9 miles from Marathon), demolished by the Persians, and probably among those not required by the popular will to be rebuilt, was a small chapel-like structure on a rocky terrace about 328 ft. above the sea, and it consisted of a cell and pronaos with a colonnade-in-antis. The height of the columns is 5 1/2 lower diameters, the capital still projects strongly, the echinus has 3 annulets beneath it, while the necking incision is wanting. The masonry of the cell consists of polygonal coursed Pentelican marble, and the architectural portions of the facade are of soft porous limestone.

b. The so-called Temple of Nemesis at Rhamnus was a small peripteral structure of 6 × 12 columns with a pronaos-in-antis, built of marble, the capitals of whose columns exhibit a still stteper form of the echinus, than that on the Parthenon. The date of its erection should be placed at the middle of the 5 th century B.C.

c. The so-called Temple of Theseus in Athens (called a Temple of Hercules or of Hephaistos by others), of the era of Cimon (?), is a peripteral structure with 6 × 13 columns on a substructure of 2 steps, built of white Pentelican marble and resting on a foundation of stone from Piraeus, and it is located in the lower part of the city near the ancient Ceramicos. The date of the erection of this beautiful temple, one of those best preserved, is not accurately known. The coffers of the paneled ceiling bear stonecutters' marks and letters, whose forms indicate the date of about 460 B.C. [1]

Note 1. The marks here mentioned may be falsified; it is not impossible for a later individual to cut ancient marks. Proofs of this kind are always risky or even indecisive. -- On the Theseion also see Gnay's Essays in Baumeister's Denkmaler des klass. Althert. III. p. 1774-1779. Munich and Leipz-

Leipzig. 1888. -- Also Durm's Konstruktive und Polychrome Details der Griechischen Baukunst. Berlin. 1880. (Also in Zeits. f. Bauw. 1879. p. 111, 281, 411, 526). -- Dörpfeld makes the Theseion contemporary with the erection of the Temple of Sunion and holds that it is much later than the Parthenon, which may be true. (See Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abth. Athens. 1884. p. 336.

The temple structure consists of the simple cell with pronaos and posticum, and it was transformed into a church in the Christian period, to which circumstance is due its good preservation.

The columns are constructed of single drums set on each other, are set inclined toward the wall of the temple, have no very marked diminution and a scarcely perceptible entasis. The echinus of the capital is straight in outline, inclined somewhat less than 45°, and at its greatest projection slightly recurves toward the abacus; four delicately carved annulets surround the former, and a single incision marks the necking.

The architrave is 3.56 ft. long and was set a little back of the upper part of the columns, being somewhat higher than the frieze. On the latter, only the metopes of the eastern f facade and the four adjacent on the sides were decorated by reliefs; the others were left smooth, but all were set in grooves in the triglyphs. As a peculiarity should be mentioned the dissimilar treatment of the frieze on the eastern and western ends of the cell, which appears in both places as a continuous figure frieze, as in the Ionic order, and does not bear triglyphs. On the eastern end, the heavy beams of the architrave extend above the antes of the cell to the architrave of the peripteral colonnade, intersecting this at right angles and resting on the same columns. This architrave is crowned by a moulding decorated by foliage, above which the figure composition extends from one end of the figure frieze to the other. Above the frieze is a geison decorated by fret patterns, and which is crowned by a delicate ovolo moulding. On the western end, the frieze only extends above the colonnade of the cell; the architrave and frieze are returned in narrow borders on the long sides, while the geison above the

frieze over the portico extends even to the figure frieze on both sides. Corresponding to this omission of the frieze, t the antes assume broader and narrower forms. Below the stone course, which projects 5/16 inch, the antes and the wall of the cell have a separate ogee base.

The broad ceiling beams of the portico are arranged without reference to the columns; thin slabs of marble cover the spaces between these beams and have square openings, which in turn are closed by hollowed coffer slabs. This construction of the ceiling, already described in some detail, is still in part well preserved, together with its vestiges of color.

The flat tympanums, which must have formerly contained figure ornamentation, are now plain and bare; the roof has fallen; a tunnel vault protects the cell from the rain, and this contained a rich collection of antiquities a few years since, but now retains merely a few plaster casts. The ashlars are wrought and joined together in the manner previously described; the surface of the marble is covered by the golden tint peculiar to Attic monuments. The columns of the peripteral colonnade each stand on an entire block of the stylobate; beneath those of the pronaos and posticum , these step blocks are injured. In spite of the comparatively good preservation of the monument, it must still be added, that the stylobate is defective in arrangement and is greatly injured, that the floor of the portico is partially broken away, that the columns have been cut into in many places, that very many dr drums are moved back from their original positions, and that the northwest angle was much injured by lightning, so that t the angle column must be held together by iron bands; that the second column from the southwest angle of the western end has its drums quite rotated on each other, and the underlying portion of the stylobate is broken, and the greater number of the columns along the southern side are in the same condition. The middle block of the architrave on the western side shows a crack extending in an oblique direction through the frieze, cornice and the entire pediment; another portion of the architrave near the southwest angle is also shattered, and the architrave and cornice of the southern side are much injured by cracks etc. The deformations on the stylobate (exaggerat-

(exaggerated in the drawing) here run in quite irregular zig-zag lines; the four angles do not lie in a common plane, as on the Parthenon. What technical importance would be possessed by the curvature of a horizontal line below the horizon amounting to about 1.18 inches in a length of 104.17 ft., or of not quite 0.91 inch for a length of 44.98 ft.?

The cracks in the architrave, the piled-up columns, and certain inaccuracies in the execution, enable us to judge without difficulty of the influence exercised on these monuments by the so-called curvatures.

d. The Parthenon on the Acropolis at Athens, the masterpiece of Iktinos and Callicrates, erected under Pericles 447 to 434 B.C., according to Löschke's very recent investigations, was in both form and magnificence the most important of Doric buildings in the mother country of Greece. It is a peripteral structure with 8 × 17 columns on a substructure of 3 steps (Figs. 366, 367), built of Pentelican marble on a foundation partly of Piraeus stone and partly resting on the solid rock.[1] and it owes its preservation until two centuries since to the circumstance, that in the Christian period it was changed into a church. The enclosed temple is elevated above the floor of the portico by 2 steps and has at its ends hexastyle prostyle inner porticos with massive entrance doorways in the transverse walls. The eastern and principal entrance leads into the cell, divided into 3 aisles by 2 rows of columns, and which contained the chryselephantine statue of the Parthenos; the western leads into an apartment with a ceiling supported by 4 columns, the treasury of the Attic state. The cell was subdivided in its length into two principal apartments. The porticos, pronaos and posticum are all narrow.

Note 1. The temple commenced by Cimon was narrower and longer, and therefore the existing foundations of the building by Pericles must have been extended in width about 19.68 ft. along the north side. (See Antike Denkmäler, pub. by Kais. Deutsch Arch. Inst. Vol. 1. Berlin. 1887. Pl. 1, where the plan of Cimon is drawn upon that of Pericles; also details concerning its architectural history in Bötticher, A. Die Akropolis in Athen. Berlin. 1888, for which book were used the striking illustrations of the first edition of this volume;

also Baumeister, Denkm. d. class. Alter. II. Munich & Leipzig. 1887. p. 1171; lastly Harrison, J. E. Myth. and Mon. of Anc. Athens. London. 1890. p. 430-469.

Of the two current plans of the Parthenon by Penrose and Bötticher, the ground plan of the former is to be accepted as correct and assured, according to Dörpfeld's examination. It is here stated that the "Athenian people understood the entire temple to be the Parthenon, but had named the treasury with its vestibule the opisthodome", while the official designations of the rooms were opisthodome, parthenon, hekatompedos and pronaos. (See Cent. d. Bauw. 1881. p. 340; also Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abt. Athens. 1881. pl. 12). In Deltion (1890, p. 92) and in the journal Adena (1890, p. 627), Lolling published an inscription found on the Acropolis of Athens and interpreted by him, which refers to the old Temple of Athena, and which certainly states, that this was called "to hekatompedon" in the 6 th century. Hence he assumes that this also continued in the 4 th century, and it follows from this, that the different parts of the Parthenon have beenn heretofore named erroneously. But on the contrary, Dörpfeld (Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abt. Athens. 1890. pl. 15) explains the name of hekatompedon as only fixed for the old Temple of Athena during the period before the Persian war, and holds the given name of Parthenon to be correct.

The external columns are inclined toward the wall of the c cell, are composed of drums of medium size, and are surrounded by 20 flutes of elliptical section, which intersect in sharp edges and disappear at the lowest annulet of the capital. The columns each stand on two blocks of the stylobate, which abut at the axis of the column; they are not strongly diminished and have a slight and scarcely perceptible entasis; the capital has a steeply inclined and almost straight echinus and is surrounded below by 5 annulets, the necking being limited by a single incision. The surface of the architrave is somewhat inclined, and as at the Theseion, it projects beyond the upper surface of the column, is composed of three blocks in its width, and is but very little higher than the

frieze, whose metopes are inserted in grooves and are decorated around the temple by figure reliefs.

Triglyphs and metopes are ornamented by a beaded astragal above the head band. The cut blocks of the frieze do not closely join in the interior of the wall, but are set with interspaces, and are therefore carefully joined together by iron cramps. The triglyph frieze does not extend above the wall of the cell; but as at the Theseion, it is changed into a continuous figure frieze, carried around all four walls, and merely reminiscences of the former are found in the regulas with drops remaining beneath the frieze.

One may concur in the explanation of Dörpfeld, that a triglyph frieze was also intended here, but was given up during the progress of the building, and after the blocks with the regulas and drops had already been completed; but it is not applicable to the portions of the frieze made of terra cotta, in which ornaments occur over the regulas and drops. The artist certainly did not there consider anything else than the taenia and regulas complete.

The frieze is crowned by a cornice composed of a moulding with leaves, a geison and an ogee moulding, on which the outlines and marks of the former painting are still well preserved.

The ceiling of the portico is higher than the geison and was only constructed of stone beams at the ends; along the sides, large coffered slabs covered the spaces between the wall of the cell and the colonnade. The pediments were adorned by groups of figures, which referred to the birth of Athene and to her contest with Poseidon over Attica. Cymas with painted anthemion ornaments extend along the pediment cornices only and end at the angles with lions' heads; above the cornices on the sides rose a continuous row of antefixas, wh which as already stated, had no connection with the roof tiles, but were merely ornamental. The capitals of the antes exhibit on their peculiar mouldings painted eggs-and-darts as an eccentricity; the capitals of the accurately vertical columns of the pronaos and opisthodome have but 3 annulets.

The pyramidal diminution of all architectural members, of

the columns and the walls of the cell, of the architrave and of the triglyph frieze, is carried out with considerable rigor in this building; the batter (cut under a right angle) of the surfaces of the abacus (the later period follows exactly the opposed principle), and the overhang of the antes should especially be mentioned. The extremely slight entasis, not drawn in the earlier publications (which should have a magnitude of about 0.013 inch for a drawing of the column 6.31 ins. high) was first determined by the English architect Jenkins and was then confirmed by Hoffer and others. A passage of C Cicero was little considered in former centuries, but already refers to the obliquity of the axes of columns in general. For when Verres was led into the Temple of Castor, he asked what he should do there, to which the reply was made; "nothing, unless he might wish to set these columns vertical". This perfecty ignorant man asked the meaning of "setting vertical". The reply was that in a temple, there was not a single column, which was not inclined from a vertical.

The movable metallic decorations possessed by the Parthenon were already considered in treating of the architrave; transverse and rectangular holes in the centre of the architrave beneath each metope of the eastern end, as well as circular marginal traces, indicate their forms and the mode of fastening them.(Fig. 230 d). The shields were sometimes described as taken from the Persians and dedicated by Alexander, sometimes ascribed to a gift of the orator Lycurgus, having been hung up during his flourishing administration. The "Lachares fleeing from Demetrios" was taken down again in order to fill his treasury with the value of the metal; thus this important ornament had already been lost in antiquity.

Beneath each triglyph of this side is to be found on the architrave a number of small holes, drilled with a certain regularity, which are known to have served for fastening letters of bronze or of gold.

The rectangular holes without marginal marks or other accessories are found on the western end only above the axes of t the columns, and they are therefore at the joints of the architrave and beneath the centres of the angle triglyphs, so that

the decoration there must have been of a different kind.

Beneath each triglyph on the northern and southern sides, three iron pins 3/8 inch diameter and bent upward were inserted to mark the angles of a triangle, and these were again intended to receive a special decoration. (Fig. 236 d).

The intervals between the columns of the pronaos and of the opisthodome were closed by metallic grilles extending up to the capitals. Iron pins, similar to those on the architraves of the northern and southern sides, but whose purpose is not explained, are also found on the inner angle of the architrave of the opisthodome and on the sides of the capitals of the columns of the pronaos and of the opisthodome, turned toward the cell. I consider it doubtful to assume these to have been for bird screens, but that they served for fastening patches at injured places. [1]

Note 1. See Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abt. Athens. 1889. p. 233, 328.

The fate of this building, the deformation of the horizontal lines, and the painting, have all been described in various places. After its surface had been corroded, the marble was in part covered by a golden-brown lichen, especially on the eastern and western ends, while the southern side remained an almost dazzling white, and the northern side shone with a cold gray tone.

The Temple of Apollo Epicurios at Bassae or Phigaleia in Arcadia (shortly after 430 B.C.) was erected in gratitude for averting a pestilence, and was a peripteral structure with 6 × 15 columns on a stylobate of 3 steps, executed in a light bluish-gray limestone, and was built from the designs of the famous architect of the Parthenon.

Pausanias states that together with its roof, it was of marble (limestone ?), and in consideration of the beauty od the stone and its jointing, describes this as the most beautiful of the temples in the Peleponnessus, after that of Tegea. The cell had a pronaos and a posticum, both with antes, and is in its length divided into two apartments, the front one of these having pilaster-like projections along its sides, whose edges are treated like Ionic half columns and extend to the ceiling.

The second and smaller room is separated from the former by two oblique piers and a central column, and it has a separate entrance from the side. The central column exhibits a Corinthian column (perhaps the earliest use of this in Greece), so that all three orders occur together in this temple, distinguished by its beautiful proportions and details. More recent investigators prefer to consider the middle cell with columns as an uncovered court; I cannot adopt this assumption, on account of the smallness of the plan. The steps of the stylobate differ from the simple form, since they exhibit three slight recesses on the lower part; the same treatment is repeated in a unique way on the projecting lower course of the wall of the cell. The columns are surrounded by 20 flutes a and are somewhat more than 5 lower diameters in height; they stand absolutely vertical and have no entasis; like those of the Temple at the harbor on Egina and those of the Temple at Corinth. The orientation from south to north is remarkable and contrary to rule.

The capital even projects somewhat less than that of the Parthenon, and the echinus is decorated beneath by 4 annulets; the necking is marked by 3 incisions. The antes are diminished and have in the treatment of their capitals something allied to those of the Temple of Zeus in Olympia. The tympanum and the metopes of the external colonnade are left plain, while those on the ends of the cell are decorated by reliefs; the triglyph frieze is returned at the angles, but does not extend along the sides.

The more important sculptured ornamentation is here placed in the interior, an animated and richly composed figure frieze extends along above the series of Ionic columns.

The Ionic-like cyma is decorated by sculptured anthemions and only extends along the inclined cornice of the pediment, terminating with lions' heads at its angles; antefixas are here terminations of the covering tiles and ornament the cornice on the sides. The coffers are not all of similar form; square ones (of different sizes) alternate with those of lozenge shape. [2]

Note 2. For the origin of the plan, see Baumeister. III.

p. 1319-1324; and concerning the primitiveness of the Corinthian column, see Ann. d. Inst. 1865. p. 43, 61.

Since 1902, the German Archaeological Society, under the direction of Dr. Kabbadias, has been occupied with the examination of the land around the temple.and its remains, uncovering the existing materials and erecting them as far as possible, all stones being set in places originally occupied by them. Kabbadias then favors the former existence of the Corinthian column, and in a proper manner replies to the questions, why the temple had its entrance on the north, and where the sacred image stood. The existing temple was preceded by a small sanctuary, the southern room of the former, which was then enlarged in the 5 th century B.C.

The statement of Cockerell, that the coffered marble ceiling slabs rested on hollowed marble beams is not proved and has little probability. The small members and the capitals as well as the lozenge form of the coffers, and still more the sculptures, together with a passage in Thucydides decide me to regard the entire structure as a later work.(See Durm thereon, also further on the Ionic and Corinthian orders).

e. The temple of Athena on Cape Sunion was a peripteral structure with 6 columns on the facade and 13 on each side. Those existing are of slender proportions, nearly 8 lower diameters in height and with a noble treatment of the capital; 3 annulets enclose the steep echinus; a single incision cuts off the necking; 16 flutes surround the shaft in an exceptional way. This temple had about the same dimensions as those of the Temple on the Acropolis of Egina, and it was built of white marble; of it there still stand, deeply corroded by the ocean breeze, 11 columns of the colonnade and an ante with the column appertaining to it, all supporting architraves. Numerous remains cover the ground; 7 courses of the carefully joined substructure are exposed at one side. See in Mitt. d. Kais. Deutsch Arch. Inst. (Athen Abt. Athens. 1884) Dörpfeld-s report of the excavations and his drawings (pls. 15, 16; p. 324-327), according to which the plan of an earlier temple of porous stone was found beneath the marble temple, whose stylobate and steps were even better preserved than those of the

later temple. Nine columns still stand upright and support a portion of the entablature; the plan of the interior of the temple can no longer be determined.

The sketch published by Blouet at the time is to be regarded as in general satisfactory. As already stated, the building might be contemporary with the Theseion at Athens.

IV. Prototypes and Contemporaries of the Attic Doric Marble Structures.

At the head of the prototypes and contemporaries of the Doric marble temples of the 5 th century, executed in porous shell limestone or in ordinary dense limestone with wooden beam ceilings of the porticos and cell, but distinguished by the fixform of the style, as already stated, there stands in the first line the so-called Temple of Poseidon in Paestum, so solemn in its effect.

a. The Temple of Poseidon in Paestum, a peripteral structure of the middle of the 6 th century, with 6 × 14 columns on a substructure of 3 steps, with pronaos and opisthodome, colonnades between antes and stairs at the entrance; the cell d divided into 3 aisles by 2 rows of columns, the central aisle narrow and long.(About 13.12 ft. wide).

The columns have 24 flutes, are diminished quite strongly with hardly any entasis and are inclined inward; the abacus of the capital projects widely, the echinus is not high and has an elastic curve, and there are 4 annulets and 3 incisions at the necking. The architrave is in blocks about 14.76 ft. long and lies in the same plane as the upper circumference of the column; the triglyphs are slender, somewhat curved forward at the top, as on Temple C in Selinus; the grooves end in pointed-arched form without coves at the angles; the metopes are without sculptured ornament, are broad and have head bands of height equal to those of the triglyphs; the geison is of strong height and projection, and it is decorated at top by a cove and a small bead instead of a cyma. The total height of the entablature goes into the height of the column 2 1/2 times. Besides the customary forms, the internal members exhibit the half round. The columns in the interior of the cell have 20 flutes on the lower order and

only 16 on the upper one.(Probably arranged in accordance with the absolute dimensions of the surfaces of the columns). The outward and inward curvatures and cracks on the great horizontal architectural members are to be ascribed to defects in workmanship, easily to be recognized. The only temple in the Grecian style of architecture in which the internal construction is preserved for us in a form worthy of examination, it is also distinguished by solid construction in ashlar masonry, beautifully joined together without mortar. The same limestone was used here as in the Basilica and the Temple of Demeter, and it therefore required a coating of stucco and color. The outer surfaces are not smoothly dressed in some places; there frequently occur roughly worked surfaces surrounded by drafts, so that the temple cannot be assumed to have been completed in all its parts.

b. Beside it stands the well known Temple of Zeus in Olympia, more renowned for the place of its location and for the very famous and most important work of Grecian sculpture placed within its walls, the chryselephantine statue by Phidias, than for its architectural beauty, was a peripteral structure 6 × 13 columns, with front and rear vestibules with antes, a built of native tufaceous limestone or shell conglomerate by the Elean Libon (only the roof tiles consist of Pentelican marble). The diameters of the columns frequently differ about 2 inches, and they were strongly diminished; the capital has a broad abacus and "a high, soft, nobly profiled echinus" with 4 Attic annulets and 3 incisions at the necking. The entablature was proportionally light; the length of the architrave blocks varies from 15.81 to 17.028 and 17.22 ft.; in width it was composed of three unequal blocks 2.56, 1.67 and 2.33 ft.; and as usually the case, the outer blocks also here abut against each other at right angles, the joint on the long side extending through, those behind it in the opposite direction. The frieze and architrave in the interior of the peripteral colonnade lie in the same plane, and a vacant space was left between the triglyph frieze and the continuous frieze. The ante capital was elegantly shaped, and it consisted of a cove and a peculiar ogee leaf moulding, almost

exactly similar to that at Phigaleia. As in Phigaleia and on the temples in Selinus, an internal triglyph frieze was carried above the front and rear vestibules, and this was returned as in the temples mentioned. The cell walls are constructed of ashlars carefully fastened together by iron cramps set in lead, the lowest course being composed of blocks set on edge (as on the Parthenon, Theseion, in Paestum etc.), and the cell was internally divided into three aisles by two rows of columns, which in part may have been separated from each other by metallic grilles, for which fixing holes seem to appear on the lower drums of the three western pairs of columns of the central aisle. [1]

Note 1. See the excellent and detailed representation in the great German work: Der Ergebnisse der vom Deutschen Reich veranstalteten Ausgrabungen. II. Architecture. Berlin. 1892.

The temple was most fully described by Bausanias among all Grecian monuments. He speaks of the gilded prize vases on the angles of the pediment, the gilded goddess of Victory on the apex of the gable, the rich figure sculptured decorations of the pediment and of the metopes at the end of the temple. He mentions Paeonios of Wende and Alkamenos, the contemporary of Phidias and next to him the first of artists in sculpture, as sculpturs of the pediment figures. He intimates that the beautiful statue of Nike found by the German expedition was the work of the same Paeonios. But in comparison with the statues of Nike and the figures by Phidias, the pediment statues are of such inferior value, that they cannot have been the work of the same or of equally famous contemporary artists. After the image of Zeus had been completed, it may have been decided to award to the sculptors mentioned the commission for the execution of the new pediment statues in place of the antiquated and slightly artistic ones, which was not carried out during the beginning calamities of the civil war, so that a connection arose between the names of famous artists and the ungraceful pediment sculptures, again brought to light. Pausanias likewise mentions the bronze doors, the inner colonnades in two tiers, one above the other, by which access was made possible to the statue of the god, the winding

staircase even leading upon the roof, which must have been n narrow, close and built of wood, the god being seated on a throne, his head adorned by a garland of olive leaves, and with the Nike standing on his right hand, and the walls were also decorated by paintings by Panainos, the consecrated gifts and the great altar of sacrifice. The temple and its art works sank into ruin and disappeared beneath the alluvial soil; the French expedition under Blouet merely recovered a portion of it, and the latest German expedition considerably increased the finds, although the parts of the building were found to no longer rise more than 4.92 ft. above the original level of the earth beneath them.

There follows here:--

c. The Temple of Aphaia on the island of Egina stood an a far visible high terrace of rock, and it has a peripteral structure of 6 × 12 columns on a substructure of 3 steps. The temple structure consists of cell, pronaos and opisthodome, opening at the ends in colonnades between antes, the interior being divided in three aisles by 2 rows of columns, 5 in each. The columns are moderately diminished with a scarcely perceptible entasis and are surrounded by 20 flutes. The capital is still rather high and strongly projecting, decorated by 4 annulets, the necking indicated by 3 incisions. The flutes end in flat curves, their endings coinciding with the lower edge of the lowest annulet. The face of the architrave is brought forward in front of the upper circumference of the column; the entablature goes 2 1/2 times into the height of the column; the latter is 4 1/2 times as high as the substructure of 3 steps. The height of the pediment (tympanum) is 2/15 its base line; the wall of the tympanum is set back behind the face of the architrave. The angles of the pediment are decorated by griffins carved in marble, and the apex by a scroll ornament and two small figures of the same material. The famous pediment figures (now in Munich) are likewise executed in white marble, while the entire architectural portions are constructed of porous limestone, covered with stucco and decorated by painting, numerous vestiges of which are still preserved. [1]

Note 1. On this A. Furtwängler and his colaborers remark in the work:-- Aegina, Das Heiligtum der Aphaia. Munich. 1906, p. 49. Note. "We have not succeeded in finding remains of light yellow stucco coating on the walls, but the walls themselves shine (?) in their natural yellowish color, so far as the stone is still freshly preserved." I shall not enter further on the "shining" of the "freshly preserved" stone surfaces, that are nearly 2500 years old, but on the contrary will add a note from my diary of Sept. 13, 1869:-- "Temple on Ægina of grayish yellow limestone with stucco coating, on the western side are still many remains of orange-yellow colored coating on the walls of the cell. Likewise on the columns are colored remains of stucco. On the ashlars are remains of splendid smalt blue color. The mutules with deep yellow, the band above being red. This was seen 40 years since! My companions were the painter Klose, still living in Carlsruhe, and the architect Ziller Jr., then in Athens.

Regulas are found on the architraves of the pronaos and of the colonnades of the cells, while to them corresponds no arrangement of triglyphs in the frieze lying above them. Above the upper colonnade of the cell, the masonry appears to have been extended to the roof, and solid blocks of stone with arrangements for connection with the adjacent courses of tiles were placed instead of gutter tiles at the junction of the wall and the surface of the roof. Cockerell explains these as being the enclosing blocks of a hypaethron, which the smallness of the temple, aside from the previous statements in regard to this point, causes to appear unnecessary. The sun might already be quite high and still cast its rays throughout the entire length of the temple. The conditions for lighting the interior were very favorable here by means of the great doorway and the elevated site of the temple. The columns were inclined toward the cell; 21 of them still are standing, much worn on the upper surfaces, in many places held together by iron bands, and still partly connected by architraves, while the frieze, geison, and the walls of the cell lie prostrate on the ground. The clamping together and the provision for setting the dressed stones are of interest. (Note 1 above).

d. The so-called Temple of Hercules in Akragas is a peripteral structure with 6 × 13 columns with an extended arrangement of steps on the eastern front. The cell is still long and is placed between a pronaos and an opisthodome, each with a colonnade between antes; at the end of the cell was a small shrone for the statue of the god; left and right of the entrance were stairs, which led to the attic. The columns had 24 flutes and were quite strongly diminished, yet were almost without entasis; the echinus was high and inclined less than 45°, but was still somewhat swelled in form, decorated beneath by 4 annulets, and with a single incision as a necking member. The face of the architrave coincides with a tangent to the upper surface of the column. On the whole, the entablature is still high and heavy, the ante capitals are still of uncouth shape, and the grooves of the triglyphs end in recurved cushion forms. The building material consists of yellowish porous limestone; the surfaces were covered by stucco.

e. The so-called Temple of Concordia in Akragas is a peripteral structure with 6 × 13 columns, and is of medium size with columns arranged between antes, opisthodome and pronaos, with stone steps at the entrance and leading to the roof, with a pediment wall and a peculiarly formed opening in this above the ante colonnade. The columns are not greatly diminished, are without marked entasis, have an echinus of straight profile on the capital, a series of 4 annulets, but no incision at the necking; the ante capitals are of heavy form. The materials for the temple were furnished by the yellowish limestone already mentioned; its better preservation is probably due to the circumstance, that it was once transformed into a Christian church (in the 15 th century; S. Giorgio della Rape). For this purpose, the cell walls were unfortunately perforated by 12 large openings with round heads, and the intervals between the columns were walled up in order to thereby produce a 3-aisled interior. The entablature of the temple is rather heavy; the columns each consist of 5 drums. It was r restored in 1788 and now belongs with the best preserved monuments of antiquity.

f. The so-called Temple of Casotr and Pollux in Akragas w was peripteral with 6 × 13 columns on a substructure of 3 steps.

The Sicilian Archaeological commission caused the three columns of the northeast angle with the corresponding entablature and that portion of the pediment to be rebuilt with the ancient materials. The yellowish limestone was covered by stucco; lions' heads, red and blue frets and painted palm leaves have preserved evidences of polychromy.

g. The so-called Temple of Demeter and Proserpina in Akragas, whose ruins were built into the Church of S. Blasius, was a small cell with antes; only the substructure and a portion of the cell wall resting on 3 steps are still preserved; nothing now remains of the cornice and of the columns.

h. The so-called Temple of Asclepios in Akragas is still smallar then the preceding, and it was a double ante temple on a substructure of 4 steps. Of this, there yet remains two columns and the antes of the northern angle of the cell wall to a height of about 16.40 ft., with most of the walls of the cell and the southern antes. No portion of the capitals or of the cornice now exists.

l. The so-called Temple of Zeus Polieus is Akragas was built into the Church of S. Maria de Greci. The remains consist of steps on the northern side, on which rise the stumps of 8 Doric columns, together with portions of the southern substructure and a few fragments of the entablature. The temple was really a peripteral structure with 6 columns in front.

m. The Temple at Egesta (Segeste) was a peripteral building with 6 × 14 columns, located on the brink of a deep ravine through which flows the brook Pispisa, was never entirely completed, but so far as finished, is executed in noble p proportions. Only a few foundation stones of the cell have been found; the columns are composed of an unusual number of drums (10 to 13), only roughly dressed and without flutes. The capitals are bold and are decorated by 3 large annulets; the incisions at the necking are also lacking. The face of the architrave is set forward; the entablature and the height of the pediment are finely proportioned. The material of which the temple is built is a limestone of the vicinity, which by the lapse of time has become a beautiful golden brown, and which has well resisted the effects of exposure. The date of erection is usually assumed prior to 409 B.C., before the Car-

Carthaginian invasion put an end to the architrectural activity of the Egestans. [1]

Note 1. For the study of the arrangement of stonecutting and for the procedure of this work, no other Grecian temple affords such interesting material as that in Egesta. By a thorough investigation with the necessary outlay of time and means, much valuable knowledge must be obtained there.

n. Of the Temple of Gela, only a single column still remains

o. The Temple north of the city of Himera and near the sea is a Doric structure, whose columns nearly coincide in magnificence with those of the Temples of Juno and of Concordia. B Beautiful fragments of it, among which are lions' heads, are now in the Museum at Palermo.

p. The Temple (A in Hittorf) on the acropolis of Selinus was a small peripteral structure with 6 × 14 cloumns on a substructure of 4 steps, with pronaos, opisthodome, and a cell divided in two parts in length, and it probably belongs to the completely developed style. The diminution of the column is slight, with little or even no entasis; 20 flutes surround the shaft; the echinus of the capital is straight and steep, decorated by 3 annulets, and the necking is indicated by 2 incisions. The length of the architrave blocks runs from 9.21 to 10.89 ft. The proportions of the building are in general similar to Attic. A winding stairway, which was on the right of the entrance and in the first apartment of the cell, is still to be mentioned. Not a single shaft of a column of this temple has been entirely preserved; most of the stones of the one lying nearest the sea have been removed.

q. The Temple (B in Hittorf) in Selinus, the southernmost on the eastern plateau, was a peripteral structure of 6 × 15 columns on a substructure of 4 steps, the lower steps of less height than the upper ones, with a broad flight of steps extending along 3 intercolumniations at one end, and likewise b belonging to the completely developed style. The cell has t the same plan as that of temple A; the first apartment of the cell is on a level considerably higher than that of the pronaos, and the second room is again higher than the first. The columns are slightly diminished, are animated by 20 flutes a

consist of 7 drums each. The echinus of the capital is inclined at almost less than 45°, is nearly a straight line in profile, and it has 4 annulets and a simple incision at the necking. On the other hand, the ante capital is again set back of the line of the upper circumference of the column; the blocks measure 14.60 ft. to 15.45 ft.; the height of the entablature goes 2 1/4 times into the height of the column; the height of the pediment amounts to 1/8 the base of the triangle. Vestiges of painting have been found in many places, and there is still a fine white stucco on the drums of the columns. Serradifalco describes one of them as painted with horizontal bands of red, white and blue. The astragal of the capital was red, the head band of the architrave was of the same color, and the triglyphs were blue; the draperies of the metope figures were colored; black and red frets on a yellow ground, a and black and yellow decorations occur on the terra cottas.

The remains of sculptures (5 metopes, discovered by the English architects Harris and Angell and removed in 1831) were arranged between the triglyphs of the pronaos and opisthodome, and recall the works of the era of Phidias. The nude portions of the female figures, arms, hands and feet, are made of white marble, all the remainder being of limestone from Memfrici. They are now placed in the Museum of Palermo beside the more ancient metopes from Selinus. Three columns of the temple still stand partially upright at the southeast angle; all the remainder have fallen.

r. Of the little so-called Temple of Empedocles (B in Hittorf) on the acropolis of Selinus, only the foundations, the lower portions of the western rear wall and considerable remains of the side walls have been preserved to us; but nothing of the front end still exists. According to the ruins d discovered, Serradifalco explains the sanctuary as being a Doric ante temple, while before him Hittorf, on the basis of a portion of an Ionic capital found in the vicinity, restored the temple as a prostyle structure with 4 Ionic columns before the cell, with a Doric triglyph frieze above them. The vestiges of color on this temple gave for the antes and the entablature a pale yellow tone on the stucco coating; the bands of

of the cornice, of the mutules and of the architrave, were p painted red, the mutules themselves, the triglyphs and the regulas were blue, while the drops remained white (probably originally gilded); the grooves of the triglyphs were made a dark blue-black.

s. The Temple of the so-called Juno Lacinia in Akragas is a peripteral building with 6 × 13 columns and is of moderate dimensions. The columns are slightly diminished; the echinus of the capital is boldly and nobly profiled, and decorated beneath by 3 annulets; the neck band consists of 3 incisions. The angle of the architrave is brought forward; the cornice and the ante capitals are lacking. The material is a yellowish porous limestone, now very much weatherwork, and formerly covered with stucco. Only 4 columns are wanting, and 16 still retain their capitals; the northern side still has its entire architrave and a few pieces of the frieze; otherwise, only a block of the architrave remains on the southern side. Fazell saw the temple while still complete, yet he complained of the shattered columns and the progressive dilapidation. The ruins received some repairs by Torremuzza in 1787.

t. As one of the ripest creations of the Dorism of the 5 th century B.C., O. Puchstein designates (p. 68) the Temple of Athena on Ortygia, now built into the Cathedral of Syracuse.

The shafts of its columns consist of 3 drums, of unusually careful work, with a steep and almost straight line echinus with 3 broad and flat incisions between the very narrow fillets of the annular band and a low abacus. The architrave sh shows the taenia with regulas and cylindrical drops attached to the surface of the architrave. Above this still remain 7 rather narrow triglyphs, lacking further details. The temple was famous for its splendid doors, that gleamed in gold and ivory, and for its panel paintings in the interior.

u. The close may be formed by the Temple of Zeus in Akragas, striking by the peculiarity of the arrangement of its plan, a thoroughly mature creation of the same century.

The so-called Temple of Zeus in Akragas, a colossal work of antiquity, was a pseudoperipteral structure with 7 × 14 columns above a peculiarly treated substructure with an arrangem-

arrangement of piers in the cell and of severely treated Atlantes of archaic form as supporters of beams. (Plan in Fig. 369). The columns were moderately diminished and stumpy; 20 flutes were arragged for the complete column, and they were 1.80 ft. wide from edge to edge on the lowest drum; the echinus was high and steep, enclosed by 4 annulets and without any incisiin at the necking. The face of the architrave projects in front of the upper circumference of the column; the triglyphs and metopes were high and narrow, and the cornice was massive. The metopes were without sculptures, but as described by Diodorus, the tympanums were on the contrary most richly adorned by them. The height of the entablature goes into the height of the column about 2 1/2 times. From the mighty dimensions of the temple, certain architectural members could no longer be made of single blocks; they were composed of several courses; though relatively still of great dimensions; thus for example, the architrave was 10.50 ft. high and was composed of 3 courses of stone placed one upon the other, but the triglyph blocks of approximately equal height were monolithic; the capitals, excepting the abacus, were made of two pieces of stone, each of which measured 536.8 cu. ft.; the abacus consisted of 3 slabs placed side by side, and the drums of the columns and adjacent wedge-shaped pieces. A man could comfortably place himself within a flute of the column.

The arrangement of the interior, the entrances and the mode of lighting, can no longer be determined with certainty.

The material employed is here again the light yellow fine-grained limestone, which was covered with stucco and painting. Its rich appointments in paintings, statues and votive gifts, were repeatedly mentioned by the ancients; Carthaginians and Siculians, taken at Himera, were employed in the erection of the temple. The temple was completed in all its parts, yet the destruction of the city by the Carthaginians (408) hindered its construction. Its last portion remaining upright f fell on Dec. 9, 1401; the mighty heap of ruins, the "Palace of the Giants", has since served as a source of supply of bu-building stone; even in the past century, it furnished the

it furnished the materials for the mole of Girgenti.(Porto Empedocle).

Many small members here appear somewhat uncouth. But it should not be forgotten, that only the cut shapes of the architectural members appear to us.

To the possibility that we have before us a consecrating t temple (telesterion), Puchstein first referred. Diodorus (XIII, 82) states, that it had received no roof and also no ceiling, since the war then occurred, and then by the destruction of the city, there was no further opportunity. Its dimensions are given by Diodorus at 340 ft. long, 60 ft. (indeed 160) wide and 120 ft. high, aside from the foundations. It was the largest in Sicily, its columns were built into the walls, externally round and internally rectangular. Diodorus says nothing of the atalantes.

Since the condition of the western facade affords free scope for the imagination, then Holm and others (Geschichte Siziliens in Altertum. I. p. 298. Edit. 1870) first proposes to omit the middle column; assuming there as on the Propyleion of Athens a wide spacing of the front columns, whereby would be made possible the arrangement of a mighty entrance doorway 2 29.52 × 59.04 ft. in the clear, for example. Then an opening of 1743.12 sq. ft. would be obtained for the admission of the light, which in some degree would have lighted the interior by day. This assumption is forbidden by the eastern facade, by the parts of walls and trunks of columns still remaining, according to Puchstein's plan.(Fig. 154 in his book). Thus the great altar stood before the eastern end, which had no doorway. The contemporary inhabitants easily avoided the hard question of the lighting of the interior, since the ceiling and roof of the building were lacking. A doorway lintel with 29.52 ft. clear span was not possible with the material of which the temple was built. It could be made of dense limestone or granite. Architraves and beams over 19.68 ft. long are determined on the Acropolis of Athens, and also architraves of granite 29.52 ft. long in Luxor, which support loads in both cases. To lay the lintel on iron bars (armature) as Puchstein desires for the architrave, is not conceived in accordance with the antique.

Concerning the atalantes not mentioned by Diodorus, Fazell now states, that the last portion which fell consisted of three colossal figures and several columns. The temple fell by human powers and the weathering of the materials. The work of removing the ruins commenced in 1802. There have since been found the remains of eleven different colossal figures. At least the former existence of atlantes in the building is assured.

Pucnstein emphasizes in regard to them,"that it was no longer technically necessary for their backs to be fastened to the wall, and that they are to be recognized as structural members, whether their coursing consisted of 12 layers in height. They were not conceived as giants, but as slaves." That they were composed of layers of stone makes them no longer "structural members." Compare the detached colossal figures on the attic of the entrance facade of the Lateran in Rome, that are laid up in stone courses, and yet are not"structural members". The joints play no part, since they disappeared under the stucco coating. But they became such, as soon as they are components of the supporting courses of stone. A And that is the case here.

Heretofore the remains of atlantes found here in the interior have been restored as supporters of the ceiling beams of the middle aisle, standing on the internal piers of the aisle. Puchstein attempts to employ them on the facade. Egyptian a artists did not shronk from the use of such massive colossal figures on the facades of their temples, as those of Abu-Simbel, on the Ramesseum and Medinet Abu show. Certainly we have nothing to do with there with supporting, but only with free figures leaning against the wall. They are not structural members. Akragas likewise desired something extraordinary, of solemn effect. Why not thus transform and utilize the Egyptian motive in their sense?

What Puchstein sets araght by his procedure was the impossible basis of the representation by Cockerell and others. "T "They lack all foundation and almost all analogy". With the objection in this sense I agree. Diodorus may be quoted against the representation of the exterior. He says scarcely

anything of the interior, which was not completed. He describes the pediments and the columns, and would not such strongly participating"architectural members"have struck him? High enclosures below between the columns, over them an ideal opening and within the same one of the most effective ideas of antique architecture, -- the 38 giants standing upright and supporting the entablature", thus says Puchstein, and men will be willing to agree with him.

The demonstration of his assumption Puchstein bases on the original fallen position of the ruins of the temple, and he states that in those pieces which have remained untouched, "appears"to be furnished to him a safe starting point for determining the place formerly occupied in the building by the atlantes.

According to the enumeration of the pieces found, that Politi and Cavallari collected after the excavations of Serridifalco (p. 160), that then all sculptured blocks were carelessly misplaced, that the principal pieces of the untouched finds remaining were discovered on the southern side of the temple, where on the ruins of the wall and between the piers of the sixth bay from the south still lay the right half of one of the uppermost course of the atlantes, the portion of an ashlar extending 1.61 ft. into the wall, containing thereon the left lower arm with the palms of the hands placed flat against the wall. The elbows and the head "appeared to be broken".

From the holes above, one must conclude that two rows of a ashlars lay above it.-- The"holes", whose meaning is now repeated and over esteemed at every opportunity, as subordinate arrangements for setting, do not prove much in the given case. According to the depth of an ashlar, such might serve for sliding it, but two or more would be required; therefore one need not decide in the latter case on two ashlars lying beside each other.

To arrange one ashlar, where Puchstein attempts two, would technically be more rational, whereby the impossible so-called armature would drop out. The latter would be a patchwork in the style of the late Barocco period, but not an antique construction. It has in this case neither sense nor value.

Of the block in question it is further said,"that it so happened, that the sculptured side lies outside, as if the atlante had been placed externally on the wall. In the immediate vicinity, there is known to have laid an architrave block with an arrangement for ironwork and other architrave blocks. Likewise there was further noted further West a strethcher block between two capital blocks, probably of the sixth course with the lower half of the echinus; also west of this and behind the capital was a fragment of an atlante on the ground. These like the first had fallen with the front side toward the south".

On the north the wall"probably"fell towards the interior of the temple, or rather was overthrown. Everything is gone at the east and nothing more is to be recognized. All this is extremely valuable and good.

But one must now plainly recognize at the eastern end of t the still remaining porvion of the south wall by the position of the ruins, how the wall was inclined to the south in falling, and then how the upper heavy Doric (?) parts of the entablature were overturned, fell vertically, and in case the small blocks of the lower structure were crushed, they are in the ground with the facade.

From this is doubtless to be derived the conclusion, that the atlantes stood externally between the columns on the south wall, as well as on the others, and that Cockerell and his repeaters were on a false path.

Nothing is to be objected to the stonecutting preferred, except that the aid of iron now appears superfluous. Since the atlantes may be directly regarded as piers of courses of ashlars, which were well bonded with the adjacent masonry, then they were just as good supports for the architrave and cornice as the columns. Besides they were effectively relieved by the peculiar coursing (corbelling) of the architrave blocks. (Fig. 372). The assumed iron bars had no structural value, neither by their form nor by the mode of their insertion and bearing. If they were necessary for the front course, they must be twice as essential for the one next behind. The grooves found on the lowest architrave blocks were arrangements for hoisting, just as on the adjacent capital blocks.(Fig. 72).

The position of the faces of the atlantes was shown to be toward the south at the fall of the wall, rather than the contrary. Thus these blocks certainly were not misplaced, b but lie where the destroyers threw them; what "purzelbaum" they struck thus cannot be found and reasoned out..One may experience the strangest things in such cases. The conditions were otherwise in Selinus and on the Temple of Zeus in Athens, yet natural forces have there unitedly taken charge of the matter.

We reproduce the cross section through the temple in accordance with the scale of the dtermined ground plan and the restored courses on the basis of the suggestion given by Puchstein in his drawings, thus a somewhat assisting representation of the matter, in which I assume, that the thin wall between the aisle piers did not extend to the ceiling, but was only carried as high as assumed by Puchstein for the lower portion of the external walls -- already on account of the internal effect, the entrance of light, and of analogies. (Figs. 371, 372).

At the same height established by Puchstein, I might turn the atlantes toward the middle aisle and allow them to support the capitals of the antes and piers. Thus would one obtain on the floor available recesses for exhibiting art works, an enjoyable position of the atlantes, a correct height for the aisle piers and a subdivision of the supports in the sense of the temples at Paestum and on Egina.

With all high esteem for A. Choisy in matters of antique architecture, who here (Hist. Arch. p. 435) assumes closed walls for the middle aisle and a raised middle aisle with atlantes next the ceiling, I cannot agree on this occasion with him. Up to the height of the pilasters on the inside of the outer walls of the temple, one can fully agree with Puchstein, and on the exterior up to the top of the cornice. What followed in the interior, we do not know. For ceiling and roof can only be viewed possibilities, positive starting points no longer existing in the remains of the building, and without which reflection generally becomes fancy. The covering of t the middle aisle with stone beams 45.92 ft. long is excluded

as well as that of the side aisle with beams of 39.36 ft. free span. The connection of the piers in the direction of the longitudinal axis would be proved sufficiently possible with the materials elsewhere employed on the temple by the assumption of horizontal arches, as on early Roman buildings (Rome, Pompeii, Tivoli etc.), but otherwise only with"iron armatures," that would have required a tolerable quantity of iron bars. Let us rather leave this to wood here, but not with cross sections in the modern sense.

The placing of the atlantes in the interior won something in probality at the time by placing together the corresponding blocks found buried in the mass of ruins of the south side parts of the atlantes, the assumption and also the conception formed by me at the time must fail. That the fragments of the piers of the middle aisle have strayed as much as 49.20 ft. from their original position is indeed scarcely probable.

How the matter now rests is, that Puchstein's assumption, based on the locality of the finds, has the greatest degree of probability in itself, and it must be maintained, so long as proof is not obtained to the contrary.

To approach closer to these great questions and to attempt this is worthy of the sweat of the noble, rather than to contend about small things.

A correction in conclusion; -- I made my first measurements of the stone ashlars on the Temple of Zeus at Akragas in Sept. 1876 at the locality and published them . They are again given in the first description of the temple, and I adhere to them the more firmly, since later visits to the ruins have n not permitted me to change any of them.

Masonry walls and supports are constructed of moderately l large ashlar courses, the material being the said bad shelly limestone. Only the cornice, the triglyphs and the echinus blocks with the adjacent necking form an exception. Puchstein (p. 163) gives as the greatest ashlars in the structure, those in the architrave, 8.80 × 7.00 × 3.54 ft. = 309.0 cu. ft., while the cornice blocks measure 12.2 × 4.93 × 4.60 ft. = 309. cu. ft., the triglyphs are 10.13 × 4.92 × 4.60 ft. = 300.0 cu.ft.,

and the capital blocks 10.54 × 5.07 × 8.80 ft. = 537.0 cu. ft. The blocks all have square grooves for hoisting, 4.85 × 4.85 and 5.05 × 4.04 ins. in width and depth.

V. On the Attic Doric marble buildings, whose prototypes and contemporaries belong to the Ionic and Corinthian orders.

The refinements of the details, of bases, capitals and cornices required a dense material. If in Sicily and southern Italy Ionic capitals of porous limestone with stucco coating indeed exist, yet by far the greater number of Ionic and Corinthian temples are constructed of dense or crystalline limestone, i.e. of white marble. On the oldest Grecian Ionic building on Italian soil -- in Locri -- was employed dense limestone, as well as for the Doric-Corinthian in Paestum.

To conclude from the facts, in time "some old architects" (Vitruvius. IV. Chap. 3, 1) like Tarchesios, Pythios and no less Hermogenes still appear to have been firmly of the opinion, that no further temples of the Doric order should be built, since in such works defective and inharmonious proportions of the members could not be avoided.

Grecian generals from the followers of Alexander the Great thenceforth ruled in Mesopotamia, Syria and Egypt. Asia Minor became the chief supporter of Grecian culture and art, a new and magnificent architectural period ensued, in which the new monarchs excelled themselves in their monumental works.

Alexandria in Egypt and Antiochia on the Orontes were prominent localities of Grecian civilization; Syracuse, Magnesia, Miletus and Ephesus were great cities of the later Grecian world. On the western coast of Asia Minor, the Attalides founded in Pergamon their magnificent residence city.

Besides these chief localities, three smaller cities were not inferior in their architectural offerings, as still shown by the buildings in Priene and many other places.

As a building material there predominated in all the white crystalline limestone (marble). In artistic perfection and skill in construction, they excel everything earlier, and also frequently in magnitude and grandeur of appearance. Thus for example, the greatest temple in Asia Minor; the Didymaeon near Miletus (358 × 164 ft), the ancient Heraion at Samos,

(360 × 181 ft.), the Artemesion at Ephesus (343 × 164 ft.) -- of the Ionic order.

To the same school belong the temples in Priene, Ephesus and Didyma. The one first mentioned must indeed have furnished the model for those succeeding it.

The stylobate, cell walls, columns, architrave, frieze and cornice, the ceilings of the porticos (peripteral), the columns in the interior are of dense white stone, without stucco and less richly painted than the Doric, only the ceiling of the cell and the framework of the roof with the rafters being of wood. Nearly perfect monumental effect is attained also by these Ionic buildings.

Among the oldest prominent temples of the Ionic style are to be reckoned those at Nearchia and Naucratis, both dating from the 7 th century B.C., the ancient Heraion at Samos, as well as the Artemesion at Ephesus, both referred to the 6 th century B.C., and then the Temple at Locri belonging to the 5 th century. These are followed in time by the Ionic buildings in Attica and of the Alexandrine period there and in the lands before mentioned. The conclusion is formed by those erected under Roman rule, as the last expression of the development of the pure late Grecian style; the buildings of Asia Minor, that from Augustus onward assumed the leading part in Grecian architecture, which echoes the preference for the Corinthian and Composite orders.

As the more promenent examples are to be mentioned in detail;--

1. Relating to the Temple of the Ionic order in Naucratis, Gardner published some remarkable details. [1] This archaic temple, dedicated to Apollo, shows in its fragments of fluted a and slightly diminished shaft, the Samian base of archaic ch character with a heavy found ornamented by scales and beads above the round endings of the flutes, above which, as in Phoenician capitals, is given a kind of echinus band with overlapping recurved leaves, on which the volute bolster must have rested. The upper portion will then not be unlike the stele capital from the Athenian acropolis.

Note 1. See Naucratis. Part 1. 1884-5. By W. M. Flinders-Petrie, with chapters by Smith, E. Gardner and Barklay V.

Head. Third Memoir of Egypt. Expl. Fund. London. 1886. Pls. 3, 4; also Part 2 by Gardner with an Appendix b: F. Ll. Griffith. Sixth Memoir of Egypt. Explor. Fund. London. 1888. Also see the original finds in the British Museum in London.

Other portions exhibit the necking ornamented by anthemions without a separating pearl bead and with the like arrangement of the flowers as on the Temple in Locri.

The second Temple of Apollo there shows in its fragments the pearl bead and scale border beneath the anthemion.

2. The Temple in Neandria on the Tschigri-Dag, where Clarke found the peculiar Ionic capital was regularly excavated by Koldewey. It consists of a substructure 42.21 × 84.33 ft., on which stood the cell without external columns, enclosing a room 26.64 × 65.01 ft., which was divided into two longitudinal aisles of equal width by a central row of columns, 7 in number. The foundation was placed on the solid rock and is composed of two courses of irregular stones, separated from the regular masonry by an interposed course of stretchers 0.66 ft. thick. But the foundations of the columns are of granite blocks, while the columns themselves are of Liparite, The floor of the cell was 1.25 ft. below the threshold of the doorway; one must therefore have descended into the Temple. Access to the cell was afforder by a doorway 4.17 ft. wide, whose threshold was at the same height as the external pavement. From the fragments discovered, Koldewey succeeded in d determining the form of the interior, the ceiling, and the columns supporting the roof, which especially recalled Egyptian columns. The capitals are composed of a series of leaves, cymatium and volutes, and crown the plain and strongly diminished shafts without bases, whose lower diameter is 1.74 ft. and upper is 1.31 ft. The capitals are not alike and also do not show the same treatment of the front and rear faces. The former must therefore have been turned toward the entrance, since they exhibit the more perfected style. The capital with ascending volutes above a cymatium ornamented by leaves is then established in three places, in Columdada, Aegae, and Neandria, and it is to be termed Aeolic-Ionic. The horizontal Ionic volute is then contrasted with the vertical Aeolic,

to which should be added a third form, the Cypriote intersecting volute. According to these discoveries, the Aeolic type existed at the same time and independently of the archaic Ionic; "they are three branches from the same stem, of which the Aeolic bloomed earlier and withered". The capital from B Boghaz-Koi cited by Puchstein may be regarded as the parent of all.

The ground plan shows the most intimate connection with the so-called Basilica at Paestum; Also the old Temple in Locri had the same form, in which we must recognize the oldest form of temple.

The architrave, cornice, ceiling and roof were of wood. A main longitudinal beam was supported by the columns, and the transverse beams then rested on this and on the walls, even if the ceiling and roof did not coincide, when the columns supported the ridge-beam. The volutes were therefore placed at right angles to the longitudinal beam, just as on the Persian capital, the beam resting between the projecting bulls and not on them.

The covering of the roof consisted of flat red tiles 1.74 × 2.76 pt., with hollow tiles to match, the lowest course having a n upturned margin with peculiar water spouts. The ridge was covered by hollow tiles, which had a finial according to the fragments found, as on the Heraion at Olympia, while the hollow tiles were closed on the edge of the gutter and showed sculptures on the closing surfaces. A cyma ornamented by sm small figures extended along the pediment, recalling the similar treatment on the older Artemesion in Ephesus.

Among the temples mentioned, that on Lesbos should not be omitted, on account of the similarity of the capitals.

3. Temple of the Napean Apollo on Lesbos, whose remains w were removed and built into later structures. The very archaic volute capitals are of the highest interest for the history of art, and five examples of them were built into the old Church of Taxiarchis. The spiral lines are here likewise drawn with a free hand, and their radii of curvature do not diminish uniformly. The capitals exhibit a great similarity to the capital from Neandria published by Clarke.

The shafts of trachyte that have been found, 23 in number, have diameters of 1.64 to 2.33 ft. The bases belonging to them consist of of a great torus of segmental form and a smaller astragal above it with the apophyge of the shaft.

4. The Heraion at Samos was dipteral with 10 columns according to some, according to others a pseudodipteral structure with wooden beam ceiling in panels. Several marble bases of columns are still preserved in their old places; others lie scattered around. The bases are archaic and heavy, with a fluted bolster below, the diameter of the column is 7.41 ft.; the capital shows a Doric echinus with a carved egg-and-dart moulding.

As on the Erectheion and other monuments, the capital was composed of two pieces in height. In any case, the building is indeed the earliest Ionic stone monument of importance.

5. The Temple in Locri. On the site of an earlier temple of an order no longer to be determined, stood the peripteral building with an elongated cell, pronaos and oposthodome, on a substructure of three steps, whose blocks were in a single external layer, but were doubled and clamped together at the angles. The surrounding portico had 6 × 17 columns, which were connected with the stylobate by dowells. The intercolumniations between axes differed on the ends and sides, the former being 10.4 and the latter 8.66 ft.

Pronaos, opisthodome, and also the porticos, had pavements of stone slabs laid on a grating of beams. No stone of the cell wall now remains in place, and only mere fragments of the columns are to be found. Their bases recall by their form those of the Heraion on Samos; the shaft is covered by shallow flutes ending in semicircular form, above which is a necking ornament of anthemions. While on the Erectheion this is separated from the flutes by a pearl bead, we find in Locri a connection of these with the anthemion, since their do downward points lie in the spandrels of the arc. Above each fillet rises either a lotus or a palm leaf. The anthemions were painted, and the underside of the slab over the necking was red, while the ground was generally left white, the edges of the lotus flowers were colored red, as well as the points

turned downward toward the fillets between the flutes, the palm leaves were entirely red, as well as merely the margin of the covering leaf, from which the palm leaf springs.

The original fragmants found of the capitals of columns and of antes are exhibited in the National Museum in Naples.

6. The Philippeion in Olympia was a circular building surrounded by columns, according to Pausanias, whose apex was f formed by a bronze poppy-head, that held the beams together.

The german expedition described the circular portico as belonging to the Ionic order.

The restoration shows the temple or rather the Heroon as a circular peripteral structure of 18 columns and with a diameter of 50.62 ft. Theee marble steps formed the visible substructure, while the enclosing walls consisted of porous stone. The bases of the columns exhibit a simplified Attic-Ionic design in the mouldings; the echinus and the angle flowers below the single channeled volutes of the capital are left smooth. The architrave is whought from the same block with the frieze, and the cornice has dentils. The cyma was of marble, decorated by lions' heads and crowned by palm-shaped antefixas. The roof was covered by clay tiles, the portico being ceiled with stone slabs with trapezoidal coffers. The internal wall was subdivided by 12 Corinthian half columns. The ornamental forms were nearly all produced by painting, as well as the decorative details of the coffers. The colors themselves could no longer be determined. (See restoration after Adler, Fig. 373).

For this Tholos (Philippeion), Adler is guided by a correct architectural invention, and carres the cell structure higher than the annular portico in order to obtain a not too great roof surface. For the building allied in plan, the Tholos at Epidauros, on the contrary Kabbadias (Praktika. 1907. p. 185) places the portico and cell beneath a common conical roof, and lights the internal room after the precedent of the so-called Temple of Vesta at Tivoli by oblong windows in the sides. Perhaps he was led to this assumption by the recently determined windows of the eastern cell of the Frechtheion. (See Fig. 374).

7. The Temple of Nike Apteros on the Acropolis of Athens,

a tetrastyle amphiprostyle structure on a white marble substructure of three steps.

The cell is built in small dimensions (12.40 × 13.74 ft.) and is open on the eastern end; two narrow piers form the sides of the doorway; the side openings were closed by grilles, whose marks still remain. Similar grilles were on both sides of the eastern prostasis between the angle column and the antes. The internal walls appear to have had paintings; the drawings of the painted ornaments of the architrave, ante capitals, cornices and coffers may be still recognized in the incised outlines, while the colors have themselves vanished.

The columns are strongly diminished and have 24 flutes; the base is without plinth and the capital without necking. The entablature goes 3 1/2 times into the height of the column; the height of the architrave is less than the lower diameter of the column. The intercolumniation is 5.18 ft. The frieze is decorated by figures; the ceiling beams rest directly on the columns.

Spon and Wheeler saw the little temple while in its original form; it was torn down by the Turks soon after the visit of these travelers. Its restoration was commenced in December, 1835, under the direction of Hansen, Ross and Schaubert, and it was completed in the following year. According to Wolters, Cimon was the builder of the "nikepyrgos" (substructure), while the temple on this is later.

7. The Temple on the Ilissos near Athens was about equal to the latter in size; it was likewise a tetrastyle amphiprostyle building, only somewhat longer in proportion to its width.

The columns were a little stumpy, the bases archaic, the capitals of beautiful design, the bolster joining the volutes was gently curved downward. The architrave was not subdivided into three parts; frieze and cornice were without ornament, and the entire entablature was somewhat heavy in proportion to the columns.

The little temple was built of white marble, and it was very well preserved until the time of Stuart, but was afterwards torn down; not a vestige of it can now be seen.

8. The Erechtheion in Athens, the most beautiful and comp-

comparatively the best preserved monument of the Ionic style on the Acropolis at Athens, has on the east a hexastyle portico, on the west being 4 engaged columns between angle pilasters with 3 windows in the middle of the intervals between t the columns. This arrangement of half columns on a high substructure, so that the bases of the half columns are higher than those of the eastern portico. The design resulted from the peculiarities of the site. Not far from the western wall, there is on the northern side the magnificent doorway, and b before this is a large porch with 4 columns in front and 2 on each side. These columns are taller than those of the eastern side. The southern side is on the same level with the eastern portico and has a spearate projection, consisting of a high substructure on which 6 caryatids (4 in front) support an elegant entablature and a ceiling with coffers. The interior has not yet been sufficiently explained in all its parts, to which difficulty the obscurities in the description by Pausanias and the various additions of a later time have contributed not a little. Restorations of the building were published by Tetaz, Hansen, Bötticher, and Niemann. Julius also undertook one. [1]

Note 1. Baumeister. I. p. 484-491.

Least fortunate appears what Dörpfeld has published thereon quite recently, also opposed by Upper Building Councillor and professor Reinhardt in Stuttgardt in the Süddeutschen Bauzeitung.(No. 50. 14 th year. Munich. Dec. 1904).

Pausanias calls this white marble monument the Erechtheion, stating it to have been a double temple, in whose inner part was a spring of salt water, agitated during the blowing of the south wind, on whose rock floor might be seen the marks of a trident, signs made by Neptune to show that the country belonged to him. Here was also worshiped the most sacred ig image of Athena, that fell from heaven; here stood the golden lamp of Callimachos, which burned continuously for a year with a single filling of oil and a wick of "Carpasian"flax; the smoke escaped through a bronze palm trunk extending to the c ceiling. In the cell of Athena Polias was the consecrated gift of Cecrops, the wooden Hermes, scarcely visible for mur-

myrtle branches; articles from the booty of the Medes were also laid up there; the sacred olive tree, the evidence of the competition of the goddess for the country, put forth its branches in the Pandroseion. The Cecropion adjoined the western portion of the temple, and the graceful caryatid portico had its front toward the south.

Under the olive tree stood the altar of Zeus Herkios; in t in the interior were various altars, where sacrifices were offered to Erechtheios, to the hero Bootes and to Hephaistos. The walls were decorated by paintings relating to the family of Butades. The colored ornamentation of the different architectural members has already been mentioned. The building shows two different times of erection, as discovered by Chandler and proved by an inscription tablet brought to England, on which are inscribed collections for the still unfinished portions of the temple.

The incsriptions recently found are interesting, and which were discovered by Ross in 1835-1836 beneath the ruins of the great battery in separate pieces, since they contain accounts for the completion of the building and afford in regard to the painting in particular, wages for sewyers, burners-in (encaustic painting), gilders, day laborers, sculptors, modelers, who furnished wax models, bronze-workers, who executed the ornaments of the coffers, superintendents, etc., are entered thereon; payments for the purchase of gold and of lead are recorded on them.

The temple is not entirely built of Pentelican marble, while the frieze of dark Eleusinian stone, the sculptures of this frieze and the roof tiles were of Parian marble. The foundations are built of porous stone; the roofs were made of wood, as proved by gains cut in some roof slabs. Tetaz assumes th that the roof slabs did not here rest on the rafters directly, but on a strong sheathing of boards. The gutters had a painted ornament, whose preliminary outlining with the point is still to be recognized. The proportions, mouldings, and treatment of the details belong with the noblest, most beautiful, and richest in antique art.

During recent years and under the higher direction of Dr. Kabbadias, general director of the Museum, by chief engineer

Balanos in Athens the fallen blocks were restored to their ancient places in the building, the broken marble beams being strengthened by iron, and the north portico was furnished with a protecting slate (!) roof. The opaion (skylight) was thus left uncovered, as it must have been originally.(Fig. 375). The two window enclosures near the entrance doorway to the Eastern cell were reset on this occasion, the external walls were consolodated, but valuable starting points for the internal treatment were not established. With closer study, the building affords esthetieally and practically still numerous puzzles, that cannot yet be solved without further information. Less on the eastern side, but so much the more on t the western facade, with the interior of the north portico and the added caryatid porch.

In the well known general views, certain details are mostly easily ignored, as the problematical is more or less skilfully evaded. First take the southwest angle. Is the connection with the caryatid porch there technically or esthetically perfect? Fig. 376 here, drawn by me in the spring of 1906 especially for the purpose of an accurate representation of the actual condition, does not say. The surfaces of the angle of the wall still bear the setting bosses, and thus they are not finished. They are not formed like antes; the anthemion ornament and the moulding is carried around to the adjacent pier without a break. The pier of the caryatid porch has no connection with the cell masonry, the cornices of the portico project plainly beyond the angle of the temple.

The front surfaces of the architrave are in a plane with t the shafts of the columns, but not with the angle piers, whose faces project about one-third of the thickness of the half c columns.

The restoration also extended the pediment ends, which was not otherwise possible, after the extension of the eastern wall.

The pediment end block is set normal, and the main cornice is likewise normally moulded and developed on both sides.

A block with the inclined pediment (cornice ?) wrought on it is proved. The angle block of the frieze is restored, i.e wrought on the existing block, and the decorated architrave

is continued to the angle of the frieze. The mouldings of t the pier capitals of the northwest angle abut against the wall surfaces and are not returned. The piers of the north portico with double antes stand about 2 1/2 ins. behind the piers of the western facade; its moulding is broken around the projection and stops on the short piece of wall. The angle stone exhibits traces of the bed of a stone, but the edge is again cut obliquely, and not as the starter of a pediment. The two Figs. 377 and 378 give a general view of the angle in its present condition.

What was the solution here? From the preceding statements it may be attempted. What has been undertaken before gives a false conception. The skylight in the eeiling of the portico on the north in the restoration was produced by the lack of a ceiling coffer on the basis of corresponding finds. How it was further treated through the attic is uncertain. There are also persons, who do not believe at all in the skylight.

In the small pamphlets of W. R. Lethaby (Greek Buildings represented by fragments in the British Museum. IV. The Theseum, the Erechtheum and other works. London. 1908). position is also taken on the question of the original form of the bu building, reference being there made to the finds in the said Museum (a caryatid, a column, an ante capital etc.). In the plan of the location (Fig. 159) is entered in black, what is certain from the remains of the building. A Choisy (p. 432) gives a grond plan with a perspective section of the design of the cell. The two stairways placed in the eastern cell a and leading downward are indeed no longer to be retained, si since the windows beside the entrance doorway have been determined. A connection of the higher and lower cells does not seem necessary in general.

A representation of the north side in its existing condition is given by Fig. 379, from which the difference in the heights of the ground may be readily seen.

10. The Temple of Athena Polias at Priene was peripteral with 6 × 11 columns and was built by Pythios in 340 B.C.

It was still standing in the Christian period, but was destroyed in the 7 th century A.D. by an earthquake. It was excavated in the years 1868-1869 by R. P. Pullan, but it was

destroyed in 1870 by the villagers on account of the finding of silver coins, and with the other buildings of the city and its dwellings was taken up anew by the Prussian government. "On Oct. 29, 1894, Kekule and Humann, on the return from Miletus and Didyma to Sokia, went aside to Priene with the cherkess (guard) Jussuf and remained there several hours, astonished by the richness and the refinement of the ruins there." The excavations were commenced on Sept. 18, 1895. On Oct. 5, 1896, they were continued by Th. Wiegand and Hans Schrader, and the results were laid down and published in the beautiful work of the Royal Museum in Berlin:-- Priene, Results of the Excavations and Investigations in the years 1895-1898 by Th. Wiegand and Hans Schrader with the aid of G. Kummer, W. Wilberg, H. Winnefeld, R. Zahn.(Berlin. 1904).

The Temple was built of coarse-grained bluish-gray marble from the quarry of Mycale, and founded on the rock 6.56 ft. deep; the cell walls are 1.48 ft. thick and the doorway lintel is 4.75 ft. long. The columns are vertical and are not inclined toward the cell wall, as Vitruvius desires.(III, 5, 4). The pavement of the portico is inclined, but is made horizontal for the columns. The execution is careful; the beds of the columns are polished, the ashlars are joined by U-clamps, the fluted shafts of the columns are composed of several drums, the capital being without a necking member. The architrave is in three bands and is decorated by fillets with cove, cyma and beaded astragal. The main cornice has dentils, and the cyma is ornamented by scrolls and lions' heads. Nothing of the frieze was found, which led to the assumption,that it had never existed. This conclusion can be contested.

11. The Temple of Apollo Didymaeos in Miletus, made famous by its very ancient oracle, was burned by Darius, then perhaps restored, entirely destroyed by Xerxes, and again rebuilt after the war for freedom. The portions now remaining to us date from the Alexandrine period and are contemporary with those of the Artemesion at Ephesus and that at Magnesia-a-M. The Alexandrine temple was built by the architects Daphnis from Miletus and Päonios from Ephesus. Vitruvius counts it with the Ephesian Artemesion, the Temple of Demeter at Eleusis,

the Temple of Zeus at Olympia, as being the four most beautiful in antiquity. Accordingt to Strabo, it surpassed all in size and remained without a roof on account of the great width of the cell. Pausanias designates it as unfinished.

It was still standing in the 5 th century A.D. and was probably destroyed by an earthquake.

An avenue for processions comprising crouching lions and seated statues led to the Temple. The statues are now placed in the British Museum. Two fluted marble columns with a cornice block and a perfect column 6.50 ft. in lower diameter a and 63.50 ft. high are still standing, together with a part of the stylobate. Of artistic interest are the capitals discovered 13 years since with busts of the gods in the volutes and a bull's head at the middle of the connecting bolster. (1897). The frieze was ornamented by great Medusa heads with adjacent scroll work; the main cornice bore decorated dentils 1.41 ft. wide and 1.90 ft. high with a projection of 1.97 ft. The cell walls were subdivided by strongly projecting pilasters with a frieze of lyres and griffins between the pilaster capitals.

French investigators gave us further explanations relating to the details of the building.(See the beautiful publication of O. Rayet and A. Thomas:-- Milet et la Golfe Latmiaque. Paris. 1877. Then E. Pontremoli and B. Haussoullier. Didymes, Fouilles de 1895 et 1896. Paris. 1904). The entire uncovering and raising of the ruins is now undertaken by the Prussian government, which has purchased a number of the houses of the village of Jeronda covering the site of the temple and has partly removed them.

Fig. 381 gives a representation of the plan. Concerning the works in progress, see the Report of the Excavations of the Royal Museum at Miletus,from the Archaeologisches Anzeiger by Th. Wiegand. Miletus. April. 1906.

12. The Temple of Artemis Leucophryne at Magnesia on the Meander was built of white marble (and of coarse-grained bluish dense limestone as in Priene and Pergamon) by the architect Hermogenes. A pseudodipteral structure on a substructure of 5 steps, it exceeded in magnitude all temples in Asia,

according to Strabo, excepting those in Ephesus and Didyma; it even excelled those in beauty of proportions. It was completed and was nearly contemporary with the Temple at Priene, therefore being erected about 330 to 300 B.C. As on the Parthenon, the ashlars of the cell were connected by iron cramps, the bases of the columns were of Attic form, the torus ornamented by leaves; the shafts were fluted and were composed of 3 or 4 blocks; the architrave and frieze were constructed of two pieces in width. The cyma was decorated by lions' heads placed over and between the columns, and anthemion ornaments were sculptured between them. The porticos were covered by a coffered wooden ceiling. In the pediment was arranged no figure decoration, as for most Ionic buildings of this period.

The temple was surrounded by a wall built of great ashlars with bosses, which adjoined the walls of the city. Rectangular defensive towers were placed at certain distances; Doric colonnades of great simplicity extended along the inside of the walls, whose surfaces were ornamented by monochrome painting.

Especially notable is the magnificent frieze representing t the combat of the Amazons, of which about 656 ft. in length were found altogether, as well as other portions recently by Villefosse, Humann and Kern. About one-third of this is in the Museum of the Louvre. [1]

Three building periods are easily distinguished on the temple.

1. The ancient dipteral structure with Ionic columns of poros, that have 32 flutes (5 th century B.C.). 2. The pseudodipteral building erected by Hermogenes, of the Alexandrine period in bluish-white marble, and 3. The Roman rebuilding, when the cell wall was surrounded by a sculptured scroll frieze and the temple court by porticos and an enclosing wall.(See Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abt. Vol. 16. Heft 2. p. 264-265. Athens. 1891.).

Further information respecting the temple and other buildings in Magnesia is given by the splendidly illustrated and beautiful publications of the Royal Museum. Magnesia am Maander by Carl Humann, Julius Kohle and Carl Watzinger. Berlin. 1904. Technically,of particular value are the Essays on the drawings of the drums of columns, the form of the bronze dow-

dowells (double cone), the ground plan, the great acroterias, the statements concerning the side enclosures of the Artemesion (p. 80-81), the altar of burnt offering etc. Also compare the original blocks in the Pergamon Museum in Berlin.

13. The Artemesion at Ephesus was the sole sanctuary of Ionia spared by Xerxes. After it was burned by Herostratos, it was rebuilt by the zealous participation of all the Greeks and according to the designs of the architect Deinocrates, by the Ephesian architects Pæonios and Demetrios. Built in a marshy location, Samian mechanics effected the draining of the site "by means of the skins of animals and charcoal" and made possible the erection of the structure on the prescribed place. The beneficent and pious feeling of the believers furnished certain parts, columns for example, in whose flutes were inscribed the name of the giver. The temple, for which the neighboring marble quarry of Coressos supplied the materials, rose as a dipteral structure from a substructure of 10 steps in front. The columns were about 58 ft. high, and 38 of them had on the lower portion of the shaft the sculptured figure ornament previously described, in the production of which Scopas was engaged, (in spite of historical statements), while Praxiteles adorned the great altar before the temple with sculptures. The capitals exhibit a treatment allied to that of the Athenian Propyleion.

The temple was plundered and destroyed in 262 A.D.; with the ruins, the Turks built in the 13 th century the Mosque of Selim, which is now likewise a ruin! [1]

Note 1. According to Curtius, E. Ephesos. Berlin. 1874. p. 34, 35.

In the spring of 1871, Wood succeeded in bringing to light some marble remains, sunk in mud 19.68 ft. deep. These prove the correctness of the fabulous dimensions of the parts of the temple given by Texier and others, as for example, columns of 10.5 ft. diameter, or an intercolumniation of 29.52 ft.! Vitruvius also locates the invention of the Ionic style of architecture at Ephesus in the 7 th century B.C.!

In 398 B.C., the priests of the temple celbrated the existence of the temple for 1000 years. The oldest known and visited temple was begun in the 7 th century, dedicated in the 7 th

century by Croesos, burned by Herostratos in 356, and again rebuilt in the Alexandrine period. Only a single stone of this wonderful building is in place. today. -- the remains of the base of a column, beneath which were found pieces of a base of the time of Croesos. The remains of the octastyle Ionic dipteral structure discovered are now exhibited in the British Museum in London, where also capitals of the old and new temples, bases, pieces of cymas and ante capitals have found shelter.

A spirited attempt at Restoration of the plan and elevation was given by the English architect A. S. Murray in the Jour. Roy. Inst. Brit. Arch'ts. Vol. 3. Series III. 1896, the ground plan being given in Fig. 382. Further information relating to the old temple is in the great work of David Hogarth. M. A. L London. 1908. British Museum Exmavations, and in W. R. Lethaby' Diana's Temple at Ephesus. Greek Building. I. London. 1908.On the discovery of the new temple, see J. T. Wood's Discoveries at Ephesus. London. 1877. Other information is in the splendid work of the Kais. Oest. Arch. Inst. "Forschungen in Ephesos" by Otto Benndorf. Vienna. 1906. In this, particularly the chapter on the ancient temple precinct by W. Wilberg (p. 221-234) with the plan of the old temple and details of the older capitals, cramps, bases of columns, gutters and leaves of doors. Fig. 383 reproduces the plan.

14. The Temple of Cybele in Sardes, so-called by Prokesch and Braun, referring to Herodotus.(V, 102). Destroyed by fire and earthquake, 6 marble columns were still standing in 1750, 3 at the beginning of the next century, and but 2 at this time, half covered by earth. Whatever cut stones belonging to the walls, entablature and columns, lie on the ground or are still concealed by it, are carried off for building purposes, accord- to the needs of the inhabitants and of Europeans, who build railways.

The temple likewise belonged with the largest of antiquity, since the shafts of its columns show diameters averaging 6.56 ft.; these indeed had a height of 58.04 ft., and thus were approximately equal to those of the Artemesion in Ephesus.. They were built of roughly cut drums of unequal sizes, with

a hole at the centre, carefully polished toward the exterior, and connected together by iron dowells set crosswise. The flutes are started on the capital blocks; a rose springs from a light scroll ornament between the volutes; scales and upright palm leaves cover the bolster. The eyes of the volutes have holes for the reception of metallic ornaments.

15. The Temple of Aphrodite in Aphrodisias was a pseudodipteral building of 8 × 15 columns on a substructure of three steps, and it was pseudotripterla at one end. Its dimensions on the lowest step of the stylobate are 72.16 × 160.72 ft.

The columns stood on plinths; the architrave was divided in three bands; the frieze was smooth, and the cornice had dentils. The style of the monument is of such purity, that it can be placed on a level with the most beautiful in antiquity. Some of the columns were given by the citizens, who inserted their names add the motive of the gift on a tablet fixed on the column. The rectangular temple precinct was enclosed by a wall, which was subdivided by coupled Corinthian columns, alternately supporting segmental and angular pediments, interrupted by niches.

16. The Temple of Zeus in Aizani (Aizanoi) in Phrygia, scarcely mentioned by ancient writers, was entirely unknown until 1825. An English traveler brought the first news of the existence of these magnificent marble ruins, which certainly date from the end of the Asiatic monarchy or the beginning of Roman supremacy. Inscriptions from the 2 nd century B.C. were found there and permit the inference of a later date; but there is too much that is beautiful in the architecture, for this to be accepted with certainty. The temple was a peripteeral structure of 8 × 15 columns on a substructure with 7 steps in front; the intercolumniation was 8.30 ft.; the distance of the columns from the wall of the cell was 15.28 ft.; the dimensions on the stylobate were 121.03 × 71.83 ft. The monolithic marble columns had diameters of 3.18 and 2.86 ft. for a he height of 27.97 ft.; the height of the capital was 1.21 ft. and that of the base (including plinth) was 2.10 ft.

The volutes are rather small and are connected by a straight band. In a peculiar way, small vases occupy the upper endings

of the flutes. The capitals of the columns between the antes have cup-like members decorated by acanthuses beneath the volutes; the ante capitals have similar ornamentation. The walls of the cell are decorated below by frieze bands, and are crowned at top by a rich foliage frieze. The architrave is divided into three bands, which are connected by pearl beads, and it is decorated at top by a richly carved egg-and-dart moulding and palm leaves; the architrave is on the inside lower, simpler, and is divided into but two bands. The frieze has vertical piped ornaments; the cornice has dentils with small modillions over them. Beneath the cell is a semicircularly vaulted room 52.48 × 29.52 ft., accessible by a stairway, that may have served for preservation of the treasures of the temple.

The temple terrace is also of importance, is for the most part preserved, and it measured 480.19 × 534.31 ft. It was b broken at one side by a flight of projecting steps 98.4 ft. wide, on the right and left of this being decorated by 22 arches, whose former facing with marble slabs is now determined. Gardens, exedras, statues and stoas were planned and built in the temple precinct, which was enclosed by a wall.

In the Festschrift (Essays) for Otto Benndorf (dedicated to him on his 60 th birthday by pupils, friends and colleagues) there was first given a photographic view of the building by Alfred Körte. Vienna. 1898. According to this, there yet stood 10 columns on the northern side with 5 Ionic columns on the western end and 2 Corinthian columns in the opisthodome, the northern and western walls in their entire extent, the western angle of the southern, while the eastern wall is entirely destroyed. The building materials were obtained from the quarry of the village of Ortadschy, and they consist of bluish-gray semi-marble of beautiful tone. The foundations are of coarse porous limestone, the ashlars without mortar and connected by U-clamps. Determinations of age differ. Texier prefers the 2 nd century B.C., Lübke and Bühlmann, Laborde, S. Reinach and Reber, the 1 st century B.C. As a peculiarity on the cell wa walls is to be mentioned a frieze band, that surrounds the bu building like an "unfolded scroll", and which is partly covered by letters. Whether the architect intended it for this re-

remains doubtful; but it is there and extends between the fret band and a crowning band moulding of moderate height and projection, above which rose the ashlar courses separated by rectangular grooves according to the bed and end joints up to the ceiling cornice. The inscription consists of . Greek letter of the Consul Avidius Quietus to archon, councillors and people. The said Consul was in office under Hadrian (125-126) according to the characters of the said letters. If this inscription alone determines it, then is this building to be referred to the time of this emperor. My former decision neither was nor could be based on examination, hence my hesitation. In any case, I come nearer to this Alfred Körte, than to the other gentlemen mentioned. And I gladly subscribe to his principle:-- "For the highlands of Asia Minor, even in the 2 nd c century A.D., is no period of declining culture, but on the contrary is the period, in which Hellenism most strongly unfolded itself. Ever again must it be emphasized, that the Hellenism of the wide plains of Phrygia was in general first conquered in the imperial period, when a careful government and an assured peace afforded it conditions favorable for development.

17. The Temple of Rome and Augustus on the Acropolis of Athens. On a stylobate of 2 steps rose an Ionic monopteral building of white marble, measuring 20.3 ft. across between centres of columns. The capitals of the columns are imitated from those of the Erechtheion,; the architrave in three bands is high, the frieze is smooth and the cornice without dentils. [1]

Note 1. See accurate drawings and restorations in "Antike Denkmäler.

In the temples of the 6 th century, in the time of Pisastratos (561 B.C.),until the beginning of the 4 th century, the D Doric style predominated in the Peloponnessus and in Magna Grecia; but it remained the Ionic in Asia Minor. Mighty and grand stand the Doric structures; priests, artists and people kept fast hold of the strong ancient style until the time after the climax of the Grecian states. Attempts to break away from the ancient style forms first occurred in the interiors of buildings. Thus for example in the temple in Phigaleia, for a Doric

exterior was an interior adorned by half Ionic columns, to which w was added as if in doubt a single isolated Corinthian column. It is well known that the Ionic style occurred in the interior of the Propyleion in Athens, until men finally dared to break away from the unity of style of the monuments on the Acropolis of Athens by the erection of the little Temple of the Wingless Goddess of Victory and of the Erechtheion.

The architects of the Alexandrine period placed their rejection of the Doric style before the world and declared the Ionic style of architecture to be the only happifying one.

But this must likewise experience for itself the change of things on earth, indeed in the same manner as the antiquated Doric style.

In Prigaleia the third -- the Corinthian style -- demanded a modest introduction, in the two tholoses at Delphi and Epidauros, on the Philippeion at Olympia, it already appeared definitely with its half and entire columns in the interior of the cell, until it had the leading part in its hands, just as expressively and knowingly displacing the preceding style as did its predecessor. The possibility and the advantages of its use in all cases, of greater richness in appearance assured to it an enduring existence. The need of creating a special form for the angle column it removed, and no subdivision of the frieze limited the freedom of its development. Its architectural forms required the best material, the dense and crystalline limestone.

It was again Athens, that was to receive within its walls the grandest products of the new third and last Grecian style, even if Asia Minor can exhibit a greater number.

There may be first mentioned here:--

17. The Olympeion in Athens was a decastyle (10× 21) dipteral structure containing altogether 120 columns, and it occupied a very ancient sacred place, was begun on a high artificial terrace in the lower city of Athens by the Pisastratides in 530 B.C., its foundations being completed by the architects Antistates, Callaischros, Antimachides and Porinos, then being abandoned on account of political disquiet and again taken in hand by king Antiochus IV 400 years later, who

who promised to bear their entire cost himself, and who had "the grand cell, the double colonnade around it, the entablature and the other ornamentation, executed by a Roman citizen, Cossutius, according to suitable proportions and with the greatest skill and highest understanding; but this work has a name, not merely in general, but even among the few greatest monuments". He counts it among the temples, "whose splendor and ingenious restoration aroused astonishment, even in the council of the gods".(See Vitruvius. VII. Introd. 15, 16, 17. A temple in the country, unfinished on account of its magnitude", according to Livy).

But even Antiocrus did not see the temple completed; Hadrian alone brought it to an end in 135 A.Da, after Sulla had previously taken some of its columns to Rome.(86 B.C.).

The ground plan of the temple is no longer to be made out with certainty. White pentelican marble served as the building material; the retaining wall of the terrace was interrupted by buttresses, and was about 2460 ft. in length (1/2 mile) and was built of stone from Piraeus.(Fig. 385). The shafts of the columns were approximately 55.76 ft. high, and the architrave blocks were 21.49 ft. long; 16 columns remain, partly with their architraves; 15 are still standing, one having fallen during a storm in 1852.

18. The Temple in Labranda in Asia Minor was a hexastyle structure with 11 columns on the longer sides; the plan consisted of a peristyle, pronaos, naos and opisthodome; the floor of the vestibule was one step higher than that of the portico.

Of the temple, built of white marble, there still stand 16 columns, supporting the architrave and a portion of the frieze, while the cell and the roof are destroyed. The columns standing on the south side are not fluted, the bases of the antes are only roughed out, the mouldings on the architrave and frieze are still plain and without ornament, a token that the temple was never entirely completed.

The previously mentioned tablets on the shafts of the columns and on the convex frieze are worthy of notice. The cyma is nearly destroyed, but a decoration by lions' heads is

still recognizable; the steps are covered by rubbish and ruins, so that only the uppermost one is visible, and their number cannot be determined.

19. The Corinthian peripteral structure with 6 × 9 columns on a terrace in Pergamon measuring 196.80 × 224.68 ft., rose on a stylobate about 9.85 ft. high, which was broken by a flight of steps on the facade. Especially worthy of mention is the rich scluptured frieze with Medusa heads between the volutes.

The temple -- recently made known as a temple of Trajan (formerly designated as the "Augusteum"), -- Was entirely constructed of white marble and had a width of nearly 65.60 ft. and a length of over 108.00 ft.. The cell appears as an ante temple; the height of the columns was 32.15 ft., including b base and capital. Between the horizontal consoles of the main cornice were fixed bronze rosettes; the middle and side acroterias wehe formed as corollas, from which grew scrolls, above which stood winged victories. Three one-story porticos enclosed the temple court, of which the eastern and western were only raised on three steps, while the northern rested on a stylobate 13.10 ft. high. The capitals of the half columns exhibit the ornamentation with acanthus and sedge leaves, as on the Tower of Winds in Athens. [1]

Note 1. Further thereon in the great German work, Altertümer von Pergamon. Vol. 2. Berlin. 1885.

Two separate monuments still stand in the temple court, a rectangular and a semicircular seat, the former erected by A Attalos II, according to an inscription. Fig. 386 (after R. Bohn) gives a representation of this with the adjacent porticos.

DIVISION IX.

Plans with one, two and three aisles, circular Temples, Temples with Adyton in the Cell, with Galleries and Stairways, Lighting of the Cell, Altars for burnt offerings, Treasuries, Temple Precincts, Telesterions and Double Temples, Magnitudes of Temples, their proportions and unit dimensions.

The plans of temples remaining to us do not all present the same arrangement. Rectangular and circular cells are contrasted, as well as later the basilican and central designs of t the Christian churches, even if not of equal importance.

The idea of the monumental canopy, as G. Semper has expressed it, is embodied in the monopteral structure of Rome and Augustus in Athens, central designs still remain to us in the Tholoses at Epidauros, Olympia, Delphi and on Samothrace; the diversity of of spacing (narrow and wide) of the columns, their arrangement in antes, their use in prostyle, amphiprostyle, peripteral structures etc. The design was previously referred to in Division IV, as well as the design of houses of deities with closed vestibules, with antes, or with prefixed porticos, as well as their triple division into vestibule, s sanctuary and most sacred place.(See Division VII and the corresponding illustrations with reference to the oldest Sicilian temples, especially in Selinus, also Fig. 387 for the comparison of the chief types of ground plans, in which evidently cannot be given all exceptions from the rule). The internal architecture of the cell must still be considered. Accordingly there are to be distinguished one, two and three-aisled cells, and those with niches at the sides (side chapels). With the first are chiefly counted the small chapel-like temples and treasuries, but also the elongated Sicilian cells, having a width of 24.5 to 38.3 ft., as shown by the following examples:--

Akragas with 24.5 ft.	Selinus with 27.8 ft.
Akragas with 26.2 ft.	Selinus with 29.5 ft.
Akragas with 31.3 ft.	Selinus with 38.3 ft.
Akragas with 37.7 ft.	Syracuse with 32.8 ft.
Paestum with 19.0 ft.	Egesta with 36.0 ft.

These temple plans have nothing to do with the Megaron with

with 4 columns.

Examples of two-aisled cells [1] have remained to us in:--

Note 1. See Fig. 388 a, b, c, d; plans in Paestum, Locri, Thermos and Neandria.

Paestum:-- the structure with 9 columns and with a clear distance between cell walls of 35.4 ft.;
and a distance between supports of 35.4/2 = 17.7.

Thermos:-- Temple of Apollo with clear distance between cell walls of 15.7 ft.;
distance between supports of 15.7/2 = 7.9 ft.

Locri:-- Ionic Temple with clear distance between cell walls of 22.0 ft.;
distance between supports of 22.0/2 = 11.0 ft.

Neandria:-- Ionic colonnade in interior, clear distance between cell walls of 26.3 ft.;
distance between supports of 26.3 = 13.15 ft.

Then follows the 3-aisled cells, that with the exception of the single-aisled, show the greatest space for the aisles. Therefore there may be mentioned:--

1. The Didymaeon near Miletus with clear width of cell of 80.0 ft.; and middle aisle of 39.4 ft.
2. The Temple of Zeus in Akragas with clear width of cell of 73.8 ft., and middle aisle of 41.5 ft.
3. The Artemesion at Ephesus with clear width of cell of 69.2 ft., and middle aisle of 23.0 ft.
4. The so-called Temple of Poseidon at Paestum with clear width of cell of 36.1 ft., and middle aisle of 14.1.
5. The Temple of Aphaia on Egina with clear width of cell of 20.8 ft., and middle aisle of 10.0 ft.
6. Temple G in Selinus with clear width of cell of 59.0 ft. and distance between centres of columns of 23.0 ft.

We recognize that the clear spans of many single-aisled temples show almost as great dimensions as those of the middle aisle of the colossal Temples at Miletus and Akragas.(39.4 to 41.5 ft.). It is assumed that the latter could not be covered; for the other, men take up the previous question and lose no words on the possibility or impossibility of a covering.

Between the two and three-aisled temples are inserted temples with cells having niches, that occur at the Heraion in Olympia. The Temple of Apollo in Phigaleia and the Sanctuary of Artemis at Lusoi in Arcadia (See Oest. Jahr. 1901. IV. 1 Heft), and if one so desires, here may be placed the three-aisled Temple of Zeus at Akragas and the Didymaeon near Miletus, the first on account of the high screens (or partition walls) between the piers of the middle aisle, the latter (a suggestion now of screens in combination with the atlantes added in given by Fig. 389) on account of the deep wall niches between the pilasters in the interior.

It is asserted of the Heraion, that the cell was "originally"planned for a single aisle, that four projecting walls were added later, before whose ends stood wooden columns, thus forming"a kind of side chapels". The wooden front colunms need not be taken quite seriously, just as little as the recently appearing sublime opinion, that those were once, like all other asserted columns of the building, similar to those heavy-headed ones with the larger part of the shaft at top, designed by Evans for the stairways and courts in Cnossos. [1]

Note 1. One should not wilfully spread such uncertain or improbable things, or make truth out of entirely doubtful hypotheses. When in a comprehensive report on the excavations in Greece during 1908, there again appear statements, that there was probably a wooden temple in Phigaleia "before Iktinos", like the ancient Heraion in Olympia" -- then might one ask, what deity showed the writer the ancient wooden Heraion in a dream!

Nothing requires us to embody in wood the motives of Phigaleia. The projections of the masonry side walls as supports for the ceiling beams lessens the span of the ceiling of the middle aisle without injuring in dimensions the effect of the interior, as would occur by the middle row of supports of a two-aisled cell. The arrangement of the projecting walls is therefore an advance from the two-aisled plan of the cell, then followed by the construction with two rows of supports as a higher step of completeness. At the Temple of Aphaia on Egina the cell or the aisle (naos) has a width of 18.7 ft. By the introduction of free supports, the middle aisle is reduced

9.85 ft., in Phigaleia to 13.40 ft. by the projecting walls, and at the Heraion in Olympia to 13.15 ft. Structural reasons alone could not have determined the introduction of projecting walls or free supports in the interior, in order to make possible the use of wooden ceilings, when men must have already understood how to construct ceilings for spans up to 39.4 ft. In any case by their arrangement, men strove for an internal effect and an interesting subdivision of the wall surfaces, an idea of which may be given by Figs. 389, 390 a.

The direct support of the ridge of the roof (ridge purlin) by columns or piers is prowed to have occurred in some early temples, but more frequently for the stoas.(Promenade and assembly porticos).

This is fully justified in an assembly portico, both structurally and esthetically. But in an enclosed room, which must have reference to a mental central point, to an image of the deity, an arrangement of middle supports is absurd, foolish and thoughtless. The arrangement of an entrance already creates a dilemma; it either requires a separate doorway corresponding to each side, or a middle doorway with the problem of accenting the supports on the pediment wall. In Paestum, men resorted to the expedient of two doorways in the entrance facade, and in Locri to the construction of but one doorway with the problem of a wall column. But both solutions are unsatisfactory.

The arrangement of an adyton, a separate cell for the image of the deity within the aisle is excluded in a two-aisled temple. One such is assured by the ground plan of the Temple of Demeter in Paestum (Fig. 395), as well as at the Temple G of Apollo in the width of the middle aisle, and another with the niche for the statue in the Megaron of Demeter, both near Selinus. Another is in the Temple of Hercules at Akragas, one in the Artemesion at Ephesus, and one confusedly overthrown in the Temple of Apollo at Delphi.

For the 3-aisled plan there occurs a further question, produced by the arrangement of small columns in the interior:-- were there floors insested between the first and second colonnades, thus forming galleries? The so-called Temple of Po-

Poseidon in Paestum is the only one, that still shows the colonnades above each other, -- but no marks of a floor are shown. The drawings of Labrouste in the year 1829 (plate IV) give no floor slabs from the architrave to the cell wall, while the earlier work of Delagardedde (An. VII, pl. V) provides them. Both works are good and reliable. It is to be assumed, that Labrouste has corrected the fancy of his predecessor Delagardette. Nothing on the building justifies the assumption of galleries of wood or stone. For the Temple of Zeus in Olympia are drawn thin beams from the architrave of the free supports to the cell wall in the great German work on Olympia, and properly so, since near the first column of the middle aisle were found doorway lintels, that were taken to be steps for a wooden stairway. For the rich interior, the assumption of a chicken ladder seems scarcely dignified, such as the small space there permits.

In their publication on the Temple on Egina, Furtwängler and Fietscher place wooden cross beams on the abacuses of the lower internal columns and the cell wall, on these being a board floor. But this likewise remains problematical, like the preceding assumption.

Why and for whom should be galleries there?

If they were there, they must be made accessible, either by wooden ladders or by stone stairs. Do indications of these still exist? Yes --! Stone satirs or arrangements for such can yet be found in the masonry on the Temple of Poseidon and on the hexastyle Temple in Paestum. Plans in the form of circular winding stairs are in Temple A near Selinus, others and even usable still are in the Temple of Hercules, in the Temple of Juno Lacinia and the Temple of Concordia at Akragas. But not stairways for hall galleries, as they do not lead to the interior of the cell, but rather to the attic as service stairs for artisans in making repairs. The marble buildings in Athens and many other places do not exhibit these practical designs in the ground plan. They are throroughly executed only in southern Italy and Sicily. In the mother country men were satisfied with step ladders, in order from these to care for any internal decoration or repairs or maintenance work in

the roof or structure.(Fig. 396; winding stairs in rectangular space with interesting stonecutting; Fig. 397; example of winding stairway in circular space.).

Lighting of Temple Cell. -- We see the interiors of Egyptian and Asian temples richly ornamented by colored decorations, sculptured ornament and costly furniture, without meeting with special arrangements for closely observing all these splendors by sunlight. The rooms, especially that one regarded as most sacred and most important, were withdrawn from all daylight.

Artificial lighting was better suited to the spirit of a religious faith, in which so much was based on magnificence and pageantry. The exclusion or the softening of the daylight in the interiors of religious buildings has been retained in the entire south until the present day, and it has been transferred to the modern Christian-catholic and Jewish Houses of God. No visitor can suppress a certain spell in these dimly or artifically lighted interiors, which affects his spirit; a feeling of consecration, of community, and of reflection is aroused and maintained by entering therein.

Grecian architects and priests also had a similar aim, when they suppressed the placing of windows in the cell and only admitted light through the great doorways, which, as already stated, furnished a more scanty lighting. In spite of all this, it is not sufficient for the modern or northern man; h his antique deity requires more light! Since no windows in Doric temple cells are preserved, and the primitive temple with metope windows can scarcely be deemed to have actually existed, a skylight must then light the house of the deity, like a modern museum hall, which men chiefly visit for the purpose of critical and artistic studies for their instruction, but not to produce in themselves a thoughtful frame of mind. The evidence of Vitruvius is also appealed to, who ca calmly states that no temple in Roma had a skylight, but prefers to learn from tradition that such existed at Athens. No other writer in antiquity alludes to such a peculiar arrangement; by the statements of all others, the contrary custom must be accepted. Every single passage of classical literature bearing directly on this arrangement has always had to suffer serious attacks of investigators.

Temples with such openings in the roof and ceiling are termed "hypaethral". The passage of Vitruvius relating thereto says:--(III,I,8):- "Yet the hypaethral temple is decastyle, both in the vestibule and the posticum. It is otherwise entirely similar to the dipteral temple; but it has columns above columns in the interior standing free from the walls, so that one may pass around, as in the aisles of the court with porticos; but the central portion is under the open sky and without a roof; on each side is an entrance into the vestibule and the rear apartment with folding doors. An example thereof is not found in Rome, but in the octastyle Olympeion at Athens". -- (I, II, 5). "Structures are to be built under the open sky and open overhead, dedicated to Jupiter with his lightning, to Heaven, to the Sun-god and the Moon-goddess, whose forms and acts we now behold in open and clear space."

A few passages in Plutarch, Ovid and Varro, are evidently tortured by various interpreters, or they are torn from their context in order to be used for one or another opinion. [1] Statements of Pausanias, that he saw various temples without roofs, for which condition he usually assigns a ruinous or u unfinished state, do not come up for consideration.

Note 1. The opposed views culminate in the treatises:- Ross, r. Hellenika. Heft 1. No more Hypaethral Temple! Halle. 1846. Bötticher, E. Der Hypathral Temple proved against the Prof. Dr. Ross by the evidence of Vitruvius. Potsdam. 1847.

Some declare that Bötticher has incontestably established the hypaethral temple: others esteem his treatise to be merely a weak attempt to oppose Ross' views.

Hence Vitruvius' entirely uncovered central aisle will suit the smallest number; to know that the chryselephantine statue and the treasures of the temple were exposed to the heat of the sun and the rains of winter, must then be considered. Hence but a part is taken instead of the whole, and at a proper distance from the statue of the deity, a small skylight is constructed, which can be readily closed when required. Others close the opening with brightly colored tapestry, such as the Romas used in theatres and amphitheatres. Quatremere de Quincy vaults the ceiling of the temple and furnishes it

with openings for light and ventilation etc. (dormer windows). Cockerell even makes the little temples on Egina and at Phigaleia hypaethral, and in his restoration of the temple at Phigaleia he covers the middle aisle with a segmental tunnel vault, which is furnished with a skylight like that in the Bracchio Nuovo. But Chipiez presented a prettier solution in p past years and one made not without artistic taste, but which does not at all correspond to the requirements of Vitruvius, since both side aisles are lighted, and the ceiling of the m middle aisle is closed.

The evidence of Vitruvius, which is further not free from contradictions, stands on too weak feet and will then only be acceptable, if as appears to have been the case on the great Temple at Selinus or at Miletus, we regard the middle aisle as an open court before a shrine in which was placed the protected image of the deity. Since other statements on the matter are lacking, we will therefore believe, that what was customary in Rome was likewise usual in Greece. Not a single o one of the numerous representations of ancient temples on slabs of marble and on coins exhibits an opening in the roof. it is also not to be assumed that esthetic considerations were entirely neglected, that the interior of a house of a deity with its costly treasures and sculptures was "exposed to the snow and rainfall from the open sky, as well as to owls and bats. Neither has any arrangement of the pavement of any temple been found, corresponding to an opening in the roof, for removing the water that would enter there; no impluvium and no drains for water are yet known, and it is probable that none ever will be. Nothing authorizes the assmuption that the Parthenon at Athens, the Temple of Poseidon at Paestum, the Temple of Aphaia on Egina etc. were hypaethral, and there is no evidence for this. When the Christians transformed the Parthenon into a church, they indeed found the lighting through the eastern doorway sufficient; according to the evidence of Wheeler and Spon (1676), they added no new openings for light; "they permitted the light to enter from the east, and this is still the entire lighting."-- Other sources contradict this.[1]

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Note 1. See Mitt. d. Kais. Deutsch Arch. Inst. Athen. Abt. Athens. Vol II. p. 42.

The lighting may not have been as abundant as in the native churches of the famous travelers, a circumstance that we of the north, accustomed to well lighted interiors (and who desire to read in churches), also meet with in the Christian churches of Italy,(see San Miniato, Orvieto etc., where instead of plates of glass, thin and transparent slabs of marble partially fill the openings for light, as well as almost all Early Christian churches);."From the vestibule we entered the temple through a lofty doorway placed in the middle of the facade; yet neither my companion nor myself were so greatly astonished by the darkness prevailing therein, as was Mr. Guilliter, since our observations in other pagan temples had already accustomed us thereto", states the visitor mentioned. And yet in taking possession of the temple for their divine services, the Christians considered it proper to decorate the walls of the but dimly lighted interior by paintings, although but half the lofty entrance doorway was probably used for the admission of light, the other half being closed by wooden folding doors (so that only one-half as much light could enter the interior as in ancient times), also to place in the choir a canopy (heaven) supported by 4 porphyry columns, and to ornament the ceiling over the altar in the choir by a representation of the Virgin in mosaic work.

Still in the Renaissance period did men become as solicitous in regard to the light in the decoration of ecclesiastical or secular interiors as now, and which if too abundant, may easily make an interior common and valueless.

In is unnecessary in the south to admit heat and light rays of the sun into the interior of the building in mass, as in the north; precautions are taken to keep them out as much as possible, as shown in all its buildings from the earliest antiquity until the modern period. [1]

Note 1. Choisy expresses himself in this sense(in Etudes epigraphiques sur l'Architecture Grecque, III Etude. L'Erectheium etc. Paris. 1884. p. 152): "Under the luminous sky of Athens, the doorway sufficed in case of need to light the cell".

Dieulafoy continues:- "For more than a century, architects and archaeologists have continually proposed hypothetical restorations of the lighting of Greek temples, especially of the Parthenon. Solutions succeed each other, but not even the most ingenious are free from just criticism. One need not be surprised; I am convinced that the cell of the Parthenon received light only through the entrance doorway.

The farthest columns were scarcely visible and seemed to flee into the darkness; the dimensions of the hall were exaggerated in the dim light; the statue of Minerva, made of precious metals and ivory, alone attracted the rays of light scattered through the air in the temple, and became animated by a mystic life intheir reflections. Who knows whether, under the shining sky of Attica, the light passing through the doorway may not already have been too bright, and whether the Greeks did not modify it by a grille placed in the upper part of the opening.

Every visitor to the East and to Greece knows how difficult it is to produce comparative darkness in the daytime in those strongly lighted countries; a badly fitted door or a slight crack in the walls suffices to light the interiors of the largest rooms.

Moreover, without mentioning paintings, that are faded by too bright light, all exposed objects in the temple would gain by protection from light and dust.

The very conclusive example of the Apadana (Persepolis) with 100 columns furnishes us with indisputable proof of the uselessness of windows in Grecian temples. The volume of the interior of the cell of the Parthenon was nearly 2,472,092 cu. ft.; the room was lighted by an opening of 538.2 sq. ft., that gives .007 as the ratio of the opening to the volume."

Pausanias (V, 20) says in a well known passage relating to the soldier found between the roof and the ceiling of the Heraion:- "After his death there, neither the heat of summer nor the frost of winter could injure the corpse, since it was protected on all sides." This would not have been the case under the hypaethral arrangement.

Architects and archaeologists, who are still attached to the theory of the hypaethral temple, must take this into account.

The important clear dimensions of the doorways in proportion to the interior, to which they gave access, besides facilitating passage, also had the further purpose of admitting light to the interior. [2]

2.We still frequently light the gateway, vestibule and entrance hall through the entrance gateway.or doorway.

Comparing on certain prominent monuments this ratio of doorway light to the interior, we have the following, where is not to be forgotten, that the dorways rise nearly to the ceiling of the room.

Buildings.	Doorway.	Middle aisle.	Ratio
Parthenon. (middle aisle).	665.sq.ft.	2925 sq.ft.	1/4
Parthenon (opisthodome).	462.	2770.	1/6
Temple on Egina.(middle aisle).	126.	449.	1/3.5
Temple in Phigaleia(middle aisle)	161.	620.	1/3.2
Temple F in Selinus. (Hittorf).	365.	3030.	1/8
Theseion at Athens.	97.	725.	1/7.4

The outermost side doorways of the Propyleion in Athens, actually intended for ordinagy passage to the Acropolis, now h have clear openings measuring about 52.6 sq. ft., which is reduced to 48.5 sq. ft. after the deduction of the lacking coverings. (4.6 × 10.25 ft.). If these proportions were satisfactory at the gate of the Acropolis, they could be so likewise for entrances to interiors, that only occupied a modest portion of the area of the platform of the Acropolis, if they had to serve the same purpose. But this was no longer the case, as soon as they must fulfil the twofold purpose of affording access and of admitting light. For this reason, we also find temple doorways in the larger dimensions. Opened and being toward the rising sun, an abundance of light streamed into the cell, which was sufficient for seeing the images of the gods and the consecrated gifts with the desired clearness.

Most poorly lighted were the elongated cells of Sicilian temples; but if we consider the more favorable conditions of light in the south, then might likewise these interiors always at certain hours of the day have had a sufficient degree of lighting, in spite of the fact, that the light at the doorway was afterwards weakened by columns placed before it. For

For in rooms requiring less light we can ow here go to the limit of 1/10; just as much might this be permitted in the detached and mostly elevated temples of the south, which no neighboring structure in narrow streets robbed of its light; yet men have not gone so far.

A lighting, such as now required for a picture gallery, was also not demanded for interiors dedicated to a deity. Men p preferred a mysterious lighting of the interior, whose effect might be heightened by lamplight and by the sacrificial fire, to the dazzling light of day; having once entered the sanctuary, one should feel himself seculded from the external world. Generally men did not even need in the interior the full light, that might stream in through the doorway.

If the peripteral temple received sufficient light through the opened doors, this was so much more the case for the so-called ante temples. The bright sunlight could enter unbroken and unhindered by colonnades.

For the same reason are windows in the cell walls proved in no special temple of the Doric order. On the problematic colossal structure of Olympian Zeus at Akragas windows between the columns of this pseudoperipteral building were indeed given in the already mentioned works of Cockerell, Kinnard, Donaldson, Jenkins and Railton; the earlier statement cannot be made clear at the ruins today.(Also see restoration in Koldewey & Puchstein).

Somewhat different are the conditions on the Ionic temples. We have to mention at least some of these, on which were constructed windows or entirely open front walls only interrupted by two free supports, on the little Temple of Nike Apteros, on the cell of Athena and on that of Erechtheus, of the so-c called Erechtheion on the Acropolis of Athens. For the former the cell is only 13.1 ft. wide and 11.5 ft. deep, and still it was thought necessary to omit the entrance wall and to allow the morning sun complete admission to the image of the deity. The same is true of the Erechtheion cell at the east, 32.8 ft. wide and 24.6 ft. deep, where besides the high doorway was arranged on its right and left a high window, as well as for the western cell of the building, where great windows were further constructed beside each other and between

the half columns. The location of the building and the ratio of the doorway opening to the floor area are extremely favorable for the lighting of the said cells; they do not need the windows -- and yet they were made! Slender rectangular windows placed between pilasters and half columns are indeed no rarities elsewhere, as shown by the pediment crowned southern facade of the western portico of the Agora in Magnesia-a-M ((German publication, p. 113), the Odeions in Termessos and C Cretopolis, and the so-called Pinacothek near the Propyleion at Athens.

As already stated, they were assumed by the English investigators for the pediment ends of the Temple of Zeus in Akragas, for the assumption of great entrance doorways fail. To even approximately light an interior 362 ft. long and 144.5 ft. wide with a height of at least 82. ft., two doorways of 7.23 ft. in width do not suffice.(The space between the half columns measures 11.8 ft.), even when they are assumed to be 29.5 ft. high. For 47700 sq. ft. of floor area is arranged about 430 sq. ft. for the admission of light, this being a ratio of 1 to 111 !

The facade walls each have in the interior five pilasters and six intervals. Cockerell places in the latter narrow rectangular windows for lighting the interior, while he assumes the longer sides to be closed, indeed with reference to the arrangement mentioned on the western side of the Erechtheion. Thus it received a doubled front light, which might suffice.

O Puchstein (p. 158) likewise opposes the possibility of lighting the interior by daylight, but only by his idea of placing the giants or slaves, 24.6 ft. high. Earlier investigators located them in the interior, but Puchstein places the 38 nude male figures as aiding to support the entablature, between the half columns and on the then wall between them, (See Division VII), and he remarks thereon, "that on the right and left of them could be formed narrow window openings". Thereby would the same result be attained, as that desired by Cockerell. Windows are thus not rejected by Puchstein also. On the question of lighting by skylights, he recalls a passage in Diodorus, that on account of the war this greatest tem-

temple in Sicily had received no roof, for which there was no further opportunity by reason of the destrocution of hhe city. Therefore the doubtful hypaethrum is also excluded here, but the question of the daylight lighting of great peripteral temple cells is neither exhausted nor finally answered. Only s side and front lighting through windows and doorways is proved.(Figs. 261, 277).

Not in direct connection with the temple in either sense were the great altars for the burnt offerings. Originally t they were chiefly of rectangular form and without ornament. Frequently consisting only of an elevation of the ground or of the piled ashes of animals sacrificed, or constructed of wood and unburnt bricks, they rose later in the Hellenistic period to become great artistic structures of stone, of which the most beautiful example must have been the famous marble Altar at Pergamon. Pausanias allows the Altar of Zeus r rising in the midst of the Altis and eastward from the Pelopeion to have consisted of a terrace (prothyris) 125 ft. in p perimeter; the terrace above it had one of 32 ft.; the total height of the altar amounted to 22 ft. Slaughtering was done on the lower terrace; the thighs of the sacrificial beasts were borne to the top of the altar and there burned. To the lower terrace led stone steps on each side, with steps of ashes from thence to the top of the altar.

The example and size of the Altar in Olympia does not prove for all temples a similar assumed position before the pediment facade and the main entrance to the temple; a view of the image of the deity over the altar and through the open temple doors was likewise possible to the sacrificer with the said height of 22 ft.

On a great terrace 145 × 124 ft. rose the Altar in Pergamon above a base of moderate height and a substructure decorated by sculptures. A great open flight of steps, whose side walls were likewise adorned by reliefs, led to the place of sacrifice. This was enclosed by Ionic porticos 10.65 ft. high and rising on three steps. These opende externally; the closed rear wall was turned toward the altar.

The completed publication of the altar lies before us in t

the magnificent great German work on Pergamon, with all the ground plans, sections, details and text, whereto were added the original finds as the greatest acquisitions of the Museum of the imperial capital, in which the finds from Magnesia-a-M and from Priene are also exhibited. They together surpass everything elswhere offered in European museums. We give from the work the ground plan and a view of the altar. (Figs. 398, 399, 400).

The treasures of the Pergamon Museum at Berlin belong amongst the most valuable that can be offered in Germany today. The small Guide (Fölmer) issued by the general management, (Berlin, 1904) aids their study and in understanding them.

The great Altar of Hiero II (269-215 B.C.) in Syracuse,[1] according to Diodorus, had the length of a stadium with a corresponding height and width. Its remains were discovered in 1839 and determined a length of ҩ650 ft. for the base with strongly projecting steps and cap mouldings, a width of 71.5 ft. at the north side, one of 74.0 ft. at the south side, with a remaining height of 19.7 ft.

Note 1. See Lupus, P. Die Stadt Syrakus im Altertum. Authorized German edition of Cavallari-Holm's Topografia archaeoogica di Siracusa. p. 42, 299. Strasburg. 1887.

Thus these dimensions differ from and are somewhat inferior to those given by Diodorus. concerning the kind of superstructure the ruinous condition of the colossal building and limited finds of a few fragments of the architecture and sculpture afford us but very imperfect information. There were found fragments of a triglyph frieze, Doric cornice blocks with lions' heads, remains of a pier capital, of a great eagle, as well as fragments of caryatids.

In his great work on the Temples of Sicily and lower Italy, O. Puchstein gives definite information in text and illustrations on the altar structure (Pl. 10, p. 70), and on the basis of the finds, an interesting restoration, especially in t the cross section through the terrace and the hearth.

Of extended rectangular ground form was the Altar of Athena Polias in Priene, from the 4 th or 3 rd century B.C. The pieces of it found belong to the Berlin Pergamon Museum, among

which are to be emphasized, particularly the well preserved balustrade slab and the relief figure. Similar to the Sarcophaguses of Sidon, small Ionic columns are placed free before the walls at definite intervals, between which were arranged draped figures in high relief. In the work by the Royal Museum (p. 121) is given a likewise very expressive and also harmonious restoration, in which the fire hearth is made uncertain, but which must indeed have been found on the podium.(Fig. 401).

Other altars for burnt offerings are also determined before the enneastyle Temple, the hexastyle Temple, and the Corinthian-Doric Temple in Paestum, as well as at the Temple of Zeus in Akragas.

An Altar of burnt offering 76.0 ft. long and 52.0 ft. wide was also discovered in Magnesia-a-M, whose most important pieces are again exhibited in the Pergamon Museum in Berlin. T The finest ornament of these forms a frieze of the figures of the gods 29.5 ft. high and almost wrought free, that covered the external surface of the enclosing wall. The attempt at restoration made in the work on Priene (p. 95) gives two Ionic porticos at the sides and two ascending stairways, that lead to the altar for burnt offerings.(Fig. 402, ground plan).

In the Alexandrine period men placed more weight on the grand design and artistic development of the altar of burnt offering than on the temple itself, for which the altar of Zeus speaks most impressively, that structurally covers a greater area than the adjacent Sanctuary of Athena and the Trajaneum, and whose sculptured decoration presents the highest in quality and quantity.

A larger Altar once stood in Parion, that measured a stadium square.

What consecrated gifts could not be brought into the temple itself were exhibited in the sacred precinct, that surrounded the house of the deity. There were placed statues under the open sky or beneath graceful canopies, enclosed by stone walls, arranged internally as heroas beset by trees and statues, the little chapels built in the form of small temples, the treasuries,and the altars erected to different deities.

The treasuries served in the sacred precincts for containing the sacred gifts, that on account of their kind and nature could be placed neither in the temple nor in the open air. Those discovered in Olympia had the form of small temples with a portico in front, that either opened with two columns between antes, or was treated as a prostyle structure. They almost invariably exhibit the Doric style.(See the great German work on Olympia and the publications on the excavations of Delphi).

The most important of these architecturally are those of t the Sicyonians, of the Metapontines, of the Megarans, and of the Geloans. Everywhere on the architectural parts were found the remains of colors; cobalt blue triglyphs and mutules on the Treasury of Sicyon; on that of Megara being blue-black c-colored triglyphs and mutules, red bands, blue tympanums, terra cotta cymas and tiles, while the latter were of marble on the Treasury first mentioned.

The most interesting building of the Geloans consisted of a naos 43.0 ft long and 35.5 ft. wide, to which was later added on the southern longer side a Doric portico of 6 columns in front and 2 1/2 in depth. The columns were strongly diminished; the capitals had 4 incisions at the necking, and the echinus had 4 annulets; the architrave was high in proportion to the triglyph frieze; the regulas and mutules lacked the drops. To it belonged the box-shaped terra cotta coverings, that were fastened to the cornice with pins. A similar design is also shown by those excavated within the sacred precinct of Delphi. Beside these then occurs the Ionic order on caryatids as free supports and tympanums adorned by figures.

Not sufficiently rich and solemn may be conceived the temple with the surrounding statues and small structures. But the impression must have been increased to the highest degree, when different temples and their accessories were crowded together on a not very large place; when entire temple precincts, as in Athens, Olympia, Delphi, Epidauros, Akragas, Selinus etc. were planned. In spite of their neglect and mutilation, the Athenian and the Olympian are today works of grand effect, w which we may again restore in our imagination, rebuilding anew the temple ruins, animating the sanctuary by statues and

consecrated gifts, filling the area with the solemn and harmonius multitude of participants in the Panathenaic festival, under the splendor of the southern sky, and against the background of a magically beautiful landscape.

In like manner may have been the effect of the temple precinct in Olympia at the time of the great festal games (Fig. 403), when Pausanias commences the fifth book of his extended description of Elis with the statement;-"Hellas offers to the eye and the ear so many objects of wonder; but the highest interest is connected with the consecration in Eleusis and the festival in Olympia". - Even if all statues and architectural works had not equally high perfection, splendor and beauty of execution as at Athens, yet must the design, grouping and the mass of the art works exhibited in the midst of the shadow spreading plane trees of the Altis must have been exceedingly attractive, with the venerable olives and the surrounding temples, treasuries, gates and porticos, with the structures of the Gymnasion, the Stadion, the Theatre etc. On more than 30 altars could sacrifices be made to the gods; the number of statues of the gods, the statues of victors, the consecrated arranged in rows were immense. Great and imposing among them may have been the statue of Zeus of the Eleans 27 ft. high, the Hercules 10 ells high, the beautiful Nike of Paeonios of Mende, the group of horses with the horse-tamers, the bronze bulls, the bronze choir of boys on the Altis wall, the dozen bronze statues of Zeus before the terrace wall of the treasuries, and the bronze memorial column with the engraved treaty of peace. As an example od a smaller design may be mentioned the temple precinct of Epidauros.(See Kabbadias, "to meron ton Asklepios en Epidauroi". Athens. 1900).

Grander, more solemn and mightier still, already by its landscape surroundings at the base of Parnassos and located on a sterile and rocky mountain slope, is the effect of the temple precinct at Delphi with its monuments and accessory buildings for theatres and sports.(See View of the landscape; Fig. 404). The results of the excawations of the Frence on this small bit of Grecian soil worthily stands beside the German in Olympia, and extend what German, Italian, English and American spirit of investigation has brought to light in other

places.(Priene, Magnesia-a-M, Pergamon, Miletus, Delos, Crete etc.). For the terrace-shaped developed ground plan of Delphi, there is to be drawn upon the official French representations of Tournaive in the publication:-- Feuilles de Delphi, executees aux frais du Gouvernement Francais sous la Direction de M. Theophile Homolle, Paris, Fontemoing 1892-1906, et seq., Plate V, but then likewise the sketches after H. Pomtow in Dr. H. Luckenbach.(Olympia and Delphi-- Munich and Berlin. 1904). (See ground plan and general elevation restored by Tournaie; Figs. 405, 406). The precinct is divided into three heights, rising from south to north, into a lower terrace, the middle great temple terrace, and the upper terrace, behind which is built the Theatre. Beginning at the entrance, the lower one is covered by the treasuries and the consecrated gifts.

The sacred way begins on the east side, leads to the west between the treasuries, bends at an angle of 45° toward the east, then passes northerly part of the eastern facade of the Temple of Apollo, next bending at a right angle to the west toward the theatre. The longitudinal extent of the Temple (half as long as the precinct itself) dominates the land enclosed by protecting walls.

An entirely different view is given to us by the temple precinct on the Acropolis at Athens. The landscape is changed, it bearing the genuine Mediterranean character. From it rises a rock not far from the sea, that bears the noblest works of all time in architecture, executed in the finest material, with grand technical perfection. "Eternal youth and intellectual vivacity" (Plutarch), distinguished and refined in spirit rises the entrance gateway,behind it on the right the Parthenon, on the left the Erechtheion, above it the gray and violet Hymettos, at the east the monotonous and brownish-red Lycabettos, in the distance being the deep blue Pentelicos with its red marble quarry. The island of Salamis is bluish, the Peloponnessian coasts in a light haze, Acrocorinth in a red mist, and the lofty mountains of Megara appearing in pure gold. In this light must one come opposite the Parthenon and see it gleam, as it again suddenly becomes what it was, as if a burning shame seized upon it in its present condition. At such a moment we see no injuries, Such evenings elevate the Athenian

landscape above constantinople, Rome and Naples.(See the description but merely indicated here in the work of Julius Braun in Geschichte der Kunst in ihrem Entwickelungsgang. II. 2 nd edition. p. 546-580. Wiesbaden. 1873. Athens, walk on t the Acropolis, the plan after the splendid publication of Kabbadias and Kawerau. Athens. 1908. Also Fig. 407.).

And yet otherwise is the effect of the view of the temple precinct of Pergamon with its different terraces and stoas, its Market, the Library and the adjoining plateau of the great Altar of Zeus, above which is the Theatre with the adjacent great terraces.(See ground plan in Fig. 408, after the great Pergamon work of the Royal Prussian government).

How greatly is our knowledge of the antique world and its art enriched by these excavations, the collection, exhibition and comparison of these treasures? Has their utilization made equal progress therewith? -- I believe not!

Besides the normal forms of temple are yet to be mentioned some special ones.

For the special form of the circular temple mentioned by Vitruvius, the monopteral, that only consisted of an open colonnade with an entablature and roof above it, the little circular temples of the Exedra of Herodes Atticus in Olympia gives an idea and an assured basis of it,and teTemple of Rome and Augustus on the Acropolis of Athens. The Choragic Monument of Lysicrates in Athens might be termed pseudomonopteral.

But in certain cases the temple also had the purpose of serving two gods as a place of worship; then a separate room for each became necessary. The cell was accordingly divided; thus originated the double temple, the naos diplous.

Then the cell might either be divided according to Egyptian prototypes by a longitudinal wall, in depth by a cross wall, or by an entablature the height could be diwided into two stories. The latter was the case in the Temple of Aphrodite Armed in Sparta mentioned by Pausanias; "the Temple had an upper story, which was dedicated to Morpho". Of a division lengthwise no examples remain. A division in depth is expressed by the Temple in Mantinea dedicated to Ares and Aphrodite; the entrance to the cell of Ares was on the eastern facade,

on the western being that to the cell of Aphrodite. Similar was the division in Sicyon; excepting that a single doorway there led to both cells; in the front room was the statue of Hypnos, in the interior being that of Apollo.

The most beautiful but also the most complex example of a temple, that was at the same time dedicated to several deities, is the Erechtheion standing on the Acropolis of Athens.

It has already been indicated, that the temple was not intended to receive great numbers of men and to hold therein such corresponding ceremonies -- they were the seats and dwellings of the deities; the great and solemn ceremonies were p performed outside them.

An exception is here made only by the buildings intended for the celbration of the mysteries, the consecrating temples, (telesterions or megaras), in which great multitudes of men found themselves together in a common religious work.

The consecrated (initiated) assembled in the sanctuary of the deity for a mystical or orgiastical worship; the temple became a hall.

We have more definite knowledge of that in Eleusis; it dated from the time of Pericles; the cell formed a square room with sides 177 ft. long, that was divided into eight aisles by seven rows of columns; a stepped construction extended around the walls in the outer aisles and was interrupted in six places by entrances. [1] Before one side of the cell was externally placed a portico of 12 columns.

Note 1. See the ground plan in Praktika. Athens. 1898. Also plate 1 in Dörpfeld's Bericht. Fig. 134.

According to Puchstein (p. 193) the Temple of Θeus at Akragas should be included here with its vast hall, that would offer in its three aisles space for the greatest festival assembly.(See tabular comparison of the kinds of temples). An allied design is shown by the Ecclesiasterion in Priene and the Thersilion in Megalopolis, to which we shall return.

Concerning the magnitudes of temples, it may finally be briefly stated, that the greater number of the houses of deities did not exceed a certain average size of about 79 to 97 ft. on the facade, so that on very many monuments the necessary

details do not differ much in size.

The given average length of the facade is also reduced to one half and increased to more than twice, so that for example, the Temple on Egina is enlarged in dimensions about four times in the Temple of Zeus in Akragas.

Here occurs a considerable difference in the dimensions of the capitals, of the triglyph frieze, of the cornice etc., a and yet the same forms are always retained, which thus experience a change to the colossal, sometimes a reduction to the graceful. The narrow annulets on the echinus, the regula and drops, the divisions of the triglyphs, the vias, and the cornice on the small Temple on Egina are entirely similar in form to those of the giant Temple of Akragas.

Besides the linear comparison in Fig. 409 of some outlines of Doric temples, which permit the recognition of the increase in magnitudes, I think it proper to make a comparison of some well known buildings nearer us with the colossal structures of the three Grecian orders.

a. For the Doric order, the Temple of Apollo (G in Puchstein) in Selinus with the Freiburg Minster, whose ridge coincides with the pediment acroteria of the Temple, and whose three aisles, including the arrangement of buttresses, finials, flying buttresses etc., find room in the principal portico of the Temple at Selinus, still leaving free a considerable space.[1]

Note 1. Diagrams for judging of the proportionate dimensions of the three greatest temples of Grecian antiquity with those of mediaeval cathedrals. (Figs. 410-412).

b. For the Ionic order, the Didymaion near Miletus in Fig. 411.

c. For the Corinthian order, the Temple of Zeus in Athens, Fig. 412.

For what we understand by good proportions of a building, the Greeks had the term "symmetrica". From this have we derived the word "symmetry", but which expresses something entirely different; for a building may be symmetrical according to modern ideas, but it does not therefore require good proportions.

The foundation of the theory or principles of good proportions in Grecian architecture has already greatly busied our

learned men and practitioners. [1]

Note 1. In this connection should be mentioned:--

Viollet-le-Duc. Dict. Rais. de l'Arch. Vol. 7. p. 532-536. Art. Proportion. Paris. 1864.

Viollet-le-Duc. Entret. sur l'Arch. Vol. 1. p. 395-406. Paris. 1863. --"It would cause deception to pelieve that proportions in architecture are the result of instinct. There are absolute rules and geometrical principles."

Aures. Nouvelle Theorie deduite du texte meme de Vitruve. Nimes. 1862.

Henzlmann, E. Theorie des proportions appliquees dans l' architecture depuis la XII dynastie des rois Egyptiens jusqua XVI siicle. Paris. (Reviewed by A. Ziesing in Allg. Bauz. 1863. Litteraturblatt. p. 31-38.

Pennethorne, J. and E. Robinson. Geometry and Optics of Ancient Architecture. London and Edinburgh. 1878.

Dumon, K. Le theatre de Polyclete, reconstitue d'apres un module. Paris. 1890.

According to ancient procedure, it would be required that the design for a structure should once be made and laid out in all its details according to fixed numerical ratios, which work must then be followed by corrections demanded by the best point of view for the observer of the building in reality, i. e., after its completion, by the laws of optics, by the immediate surroundings etc., for design and execution are not always concealed in the effect. The originally firmly fixed dimensions of the building thereby suffer small changes, for some parts must be made smaller and others larger. Plato says with this meaning:-- "Were an artist to conceive the beauty of a monument to depend on the exact carrying out of symmetry, he would only have to consider that the higher parts thereof seem smaller and the lower parts larger, than are required to produce perfect harmony. The true artist therefore neglects the requirement of rigid truth, based on the execution of exact symmetry, and he adapts in the image of his work proportions and irregularities, which satisfy the requirements of beauty in appearance, even if the requirements of truth must thereby be neglected".

If the procedure in antiquity was in accordance with the statements of Plato, we do not in our geometrical drawings of antique buildings have before us the original symmetrical designs, but the corrected ones, or to exaggerate, the caricatures of the former. In order to find the key to the symmetrical numerical ratios, we must then correct the drawings with reference to the local and other conditions, which at the time determined the correction of the symmetrical design, but which in most cases must have its own difficulties! Most of the attempts to discover the key by the methods of triangles or squares, or by the module, (when sometimes the lower and sometimes the middle diameter of the column is taken as the unit), indeed for the given reasons lead to no uniform result. The most recent attempt of Dumón (Theatre de Polyclete) to discover the module of Polycleitos likewise does not overcome these difficulties, and he finally consoles himself with the principle, "that for the purpose of beauty or even of utility, artists departed from the accurate drawing in the execution", and Ghipiez (Revue Arch. Ser. 3. Vol. 7. p. 93-99. 1881). adds in his review of Dumon's work, that [1] just to variations from the rule do the greater part of Grecian architectural creations owe their grace and beauty. As soon as the required corrections are omitted, one has to do with a work, whose esthetic worth is no higher than that of a building, constructed by an engineer according to a "formula".

Note 1. Very recently has Upper Building Councillor and P Professor Robert Reinhardt at the Polytechnicum in Stuttgart published with surprising results his talented investigations on the "Obedience to law of Grecian architecture", illustrated on monuments of different architectural periods. (Gesetzmassigkeid der Griechischen Baukunst). (Stuttgart. 1903).

Likewise Dr. Theodore Alt gives us in his book, "Die Grenzen der Kunst und der Buntfarbigkeit der Antike", Berlin, 1886, very interesting observations and conclusions on the obedience to law of art and the authority of antiquity. "Unity of the work is the second principal requirement and a supreme law f for all art works".(p. 109).

We may therefore repeat and assert, that the two principles, according to which Grecian architects labored, were first the

preparation of the design with harmonious proportions, and next the correction of this on the basis of the peculiar conditions.

Just as the derivation of the rules for proportions from t the executed buildings may lead to doubtful results, it is equally dangerous to desire to accurately deduce from the completed structures the unit of measure employed as a basis for them. On the one hand, we do not know how far the executed dimensions (widths, lengths and heights) accurately corresponded to the dimensions written on the designs; on the other, the dimensions of the parts of the building that should be alike according to the design are frequently unlike in execution, and which part may then have the true dimensions, for example, which of the unequally high columns of the Parthenon agrees with the dimensions of the design? On the great Altar of Hiero II in Syracuse, the stylobate is 71.5 ft. wide on the north side, while the corresponding dimension on the south side is 74.1 ft., thus showing a difference of 2.6 ft.; from which one of the two numbers, which were certainly written on the plan, shall the unit of measure be deduced?

Who would succeed today in accurately determining the length of our meter (or foot) from our buildings, if large dimensions in whole numbers on the plans were alone available for reference! Already the fact,that the scales employed in the construction of the building are not all equal, that some are new and others are worn out, that they were of materials acting very differently (in regard to differences of temperature), from which result the differences in laying out dimensions etc. Inequalities might be pardoned, but not mathematical accuracy!

In Furtwängler's publication of the Temple on Egina (Munich. 1906. p. 52), he assents to the principle already stated by me 16 years since:-- "It would indeed be very difficult to determine the length of a meter from modern buildings".

DIVISION X. THEATRES AND ODEIONS.

"The Drama, far from being condemned by a jealous priestly caste, far more itself even served for the worship of the gods, and in every larger Greek city, a theatre was just as certain to be found as a temple".

Dithyrambs and divinely inspired songs were sung therein. Poets here declaimed their verses before the people. It was honorable for any citizen of the state to support the theatre and an honored office by birth, or later of the monied nobility, was to undertake the supervision or arrangement of the chorus. The state provided for the actors, who were placed under the poets; it likewise made attendance possible for those without means. Plays were not given for profit, but for worship; until the period of decadence, till the wit and bitter criticism of Aristophanes appeared, the theatres were in truth temples of art, accessible to the entire people, the centre and focus of political, religious and artistic life. They deteriorated as the people were overcome by the orient, or only found enjoyment in wrestling contests, chariot races, or in the murderous games of the arena, and these became the sole and the last art enjoyments, until Christianity likewise terminated them, after obtaining control.

Arrangement and Construction. -- The beginnings of the Greek theatre are rooted in the worship of Dionysos. The dithyramb, the festal poem, that glorified the great deeds and the sorrows of the god, contained the germs of tragic poetry, while those of comedy are to be sought in the unrestrained songs of the festal jubilee and in the phallic hymns.

His deedes were sung by the line of dancers around the altar of the god; thus he formed the centre of the festal celebration and the centre of the festal place.

The space around it, on which the chorus moved, became the orchestra, the place for the dancing. Adjoining this was the space for spectators, the theatre proper.

So long as merely an alternation of the chorus and its leader expressed the dramatic play, these two divisions sufficed; a third one became necessary when the separate actors appeared.

Thespis introduced before 500 B.C. an actor not belonging to the chorus. The speaking then alternated between him and

the leader of the chorus, which then struck in less frequently with its songs. While the chorus then retained its place, a special place for the actors, the stage, was arranged behind the circular space for dancing and acting.

Therefore a theatre had to satisfy the requirements of a level place for the chorus (orchestra, conistra), a place for the actors (skene), and seats for the greatest possible number of spectators (theatron), parts that were to be arranged around the altar of Dionysos (dumeln) as the centre of the occurrences.

The chorus was originally accompanied only by a single flute player, in which accompanient the flute was subordinated to the hymn; the dance steps took the form of dance figures (skemata) by turns and twists, "in which the meaning of the hymn was made more or less visible to the eye".

Plays did not occue every day, but only on certain festivals, and then from the early morning beneath the open sky; only a late period demanded the covered theatre.

Pantomimes were renounced in the wide and great interiors; but on the other hand, the actors sought to appear larger than they actually were by the use of artificial means, such as the wearing of shoes with high soles (cothurnus), of face masks with a kind of toupee, by the padding of breast and body, and by enlarging the hands by means of gloves.

Representations at the festal plays were originally extremely simple. The body was covered by a light apron, the face stained with dregs, the head wound with ivy and the cheeks c covered with leaves-- this was the earliest costume; later c came into use other means of coloring and masks of linen cloth and wood.

The background for the dramas was not formed by God's free nature; Texier already remarked, "that it would be a great e error to believe, that in a theatre anywhere the vicinity served as a background". The multitude stood in a solid circle around the place for dancing (orchestra); in the time of Eschylus was the circle opened and the stage with its proscenium formed the background for the players. Stage walls and coulisses (periactes, rotaters) became perfected with Sopho-

Sophocles, according to the anecdote of Alcibiades in Plutarch (16), as well as according to the notice of Aristotle (Poet. 4). And on Grecian theatres of the early and late Roman period (Nero to Marcus Aurelius), stone monumental and splendid architecture extended through two stories and enclosed the stage.

Of the mechanical arrangements of the theatre we know, that roller machines (ekkuklema) were in use, "on which was shown the interior, after the rear wall had been opened"; Further hoisting and flying machines (aiorema) on which gods and men appeared flying in the air (Eschylus, Prometheus etc.); also arrangements for thunder and lightning, traps for sinking through the wooden floors, stairways to the lower rooms, on which ghosts and erynnyes ascended and descended.

The parts of the Grecian theatre building were but loosely connected together and were not combined in an architectural art work. The audience room and the stage were only connected by stairways and do not appear as an organically coherent architectural work. The audience room required no external architecture by its peculiar location on the mountain slope. Roman art first created in the organic connection of the stage building with the audience room on a detached building site the theatre building as a complete and united architectural work with its shady promenade porticos in several stories, the grand and suitably arranged stairways for access, and the effectively subdivided facade in several stories. Under its influence stood the enclosed Grecian-Roman theatres at Aspendos and Bosra with their upper porticos, open to the audience room, and their covered stages, where the players no longer appeared in the orchestra, but on a podium of moderate height, the logeion. Shelter and promenade porticos built independently from the the theatre structure were already to be found in the Hellenistic theatres (Stoa of Eumenes at Athens). They indeed served the visitors to the theatre on occasion, but were just as loosely connected with the orchestra as the stage.

Vitruvius devotes a special chapter (3 to 9, inclusive) in his book V to the antique theatre building in general and to the Grecian and Roman theatre. He first desires for both a

sound plan, then states that the plan of the foundations will be easier, if the theatre is built on a mountain slope, then describes the plan of the stepped construction and of the stairs as well as the concentric passages, then speaks of the acoustics, on the theory of harmony, on sound vases in the theatres, on the form of the Roman theatre in particular, and on "the theatre of the Greeks"in chapter VII. In conclusion he gives a few considerations on the choice of suitable sites for theatres and on the porticos behind the stage and the promenades.

There should be here given verbatim, what Vitruvius desires for the Grecian theatre:--

"In the theatres of the Greeks all does not have to be executed according to the same rules; for firstly, as in the Latin theatre in the circle below touches the angles of four triangles, so this occurs here by the angles of three squares, since now where the site of such a stage background cuts off a circular arch (segmental) (a b) is drawn the limit of the stage, this border being drawn as a straight line (tangent) parallel to the edge of the circular line, on which is placed the rear grand wall of the stage. Also through the centre of the orchestra is drawn a straight line parallel to the direction of the front of the lower stage, and where this intersects the circle (e f) on the right and left at the ends of the semicircle, there is marked the centres, and afterwards one sets the compasses in that on the right side (f) and describes a circle from the left intermediate space (e) to the left side of the stage (g); and afterwards likewise set at the left end of the semicircle (e) is described a circle from the right interspace (f) to the right side of the front lower stage (h). --

Thus the Greeks by this circle described from 3 centres obtain a more spacious orchestra and a stage background set farther back with a lesser depth of the stage framework. But t the Greeks call this the logeion, because since with them only tragic and comic actors play on the stage, but the other artists appear in the orchestra; wherefore they are also in Greek termed by different names, stage actors (skeniker; those appearing on the stage) and orchestra actors (thymeliker;

those appearing in the thymele or orchestra). The height of this (stage) room should not be less than 10 ft. nor greater than 12 ft. The stairs between the wedge-shaped divisions and the seats should to the first semicircular passage have a direction corresponding to the angle of the square, from the first range walk being carried up other stairs in the middle between them, and thus they will always be doubled upwards f for each succeeding range walk".

On account of the connection it may be mentioned here, that Vitruvius (Book V, Chaps. 6, 3) prescribes the following dimensions in the Roman theatre for the slopes of the audience room, where the seat-steps are arranged:--

Height of step -- not less than a hand-breadth (thus about 4 ins.) and not over 1 1/2 ft. (18 ins.).

Width of the step -- not more than 2 1/2 ft. and not less that 1.94 ft. [1]

Note 1. The Roman foot equals 16 digiti and 0.972 ft.

With the small height of only 4 ins., the spectators could still see over the heads of each other, but it required crouching and not sitting for them. The height of 18 ins. for t the step would nearly correspond to our modern requirements, particularly if the use of a cushion be assumed. The greater depth of the seat from 23.6 to 29.0 ins. is therefore required, since it must receive the feet of those seated higher and seat those lower, wherefore a special depression was generally cut in the upper surface of the step. The normal ratio of height to breadth of the step would thus be 40 to 74, or 4 to 7 in round numbers. Vitruvius indeed had in mind for the preceding theatres known to him, without taking into account the changes, which they experienced in the course of centuries by the alterations in the structure of the dramas and in the mode of their presentation. He did not wish to write a history of the development of the Grecian theatre, but merely to state just what was known to him.

Men have judged of the Grecian theatre until the most recent times from the words of Vitruvius, and have deduced therefrom frequently false and contradictory conclusions. What belonged to earlier and later periods was not separated from each other,

all was cut on the same pattern, and only after thorough investigations, the results of excavations and discoveries on t the sites, had taken the place of merely book learning, were our views enlarged. On the basis of fortunate finds and their thoughtful realization, we learned to recognize a history of the development of Grecian theatres, that we now divide in six periods, the oldest of which can be referred to the 6 th century B.C., and the latest to the time of Hadrian and of Marcus Aurelius.(Patara, Aspendos. [2]).

Note 2. See Das Griechische Theater by William Dörpfeld & Emil Reisch. Athens. 1896.

Our consideration may here be preceded by the graphical representation of what Vitruvius states to us (Fig. 413), where it is assumed, that Vitruvius assumes as the internal basal circle, the one forming the lowest row of seats.

1. For the theatre of the earliest period (6 th century B. C.), it may be assumed, that it consisted of a circular place for dancing with the altar in the centre, around which the spectators gathered to hear and see the songs and dances, just as now at similar performances in the country. Sacrifice was offered on the altar before the beginning of the performance--the introductory solemn act!

2. In the next early period, i.e. in the 5 th century B.C., the circular dancing place about the altar was indeed enlarged on the ground of more numerous participation in the festivals, and correspondingly also the audience area, that must have been stepped, in order to afford to the persons standing in the farthest rows the opportunity for seeing and hearing better. Therefore men sought first for the natural slopes of hills and arranged these for the said purpose, before they were compelled by special conditions to resort to an architectural stepped structure. It is not here excluded, that this may at first have consisted of wooden scaffolding, before men passed to stone construction. The dancing place was there not entirely surrounded by the rows of seats, but only for a little more than half, thus being left free in front and not enclosed by arrangements of any kind. The collecting of the spectators in a circle around the altar thereby disappeared.

In the first half of the century mentioned, in the time of Eschylus, and caused by the changes in the performances, the f free space between the enclosing walls of the stepped theatre was occupied by a building -- the stage -- a one-story and later two-story building for the dressing of the actors, and which at first consisted of wood and woven fabrics, but in time was built of stone, with a changed treatment of the front wall. This stood before the stage and was soon extended as a prefixed architectural part, designated by the name of "proscenion" and architecturally treated. It first remained a one-story structure, but in time when the drama required it, became the stage building with an upper story, from which the gods appeared on the stage on foot or on a flying machine. The person representing the god also then acted on the terrace roof of the proscenion! This in the sequence then received projecting side wings -- the "parascenion", as the endings of the permanent structure. Between the area for the spectators and the stage were found two side entrances to the orchestra, the "paradoi", by which both the spectators, the chorus and the actors, who came from the city or a distance, entered the orchestra. Dörpfeld thus speaks:-- (p. 375).:--

"During the play the chorus remained in the orchestra. The actors almost exclusively remained in that half of the orchestra, which lies as a rectangle directly before the stage. They did not ascend any platform, but when they did not occupy the step of the altar or some steps of the stage, were on the floor of the orchestra with the chorus. Only when the business of the drama required did there appear in exceptional cases one or even several actors on the roof of the stage or more properly of the proscenion, either as a person with something to do on the roof of the building, or as a god on this terrace roof, termed "theologeion". While in the earliest time the orchestra, altar and audience area were the most important parts of the theatre, we must designate as such in t the second period the stage and audience room." But the orchestra must not be omitted there and the freedom of action of the players at all heights of the building was thus unrestricted.

3. The buildings of the third period, thus of the 4 th century, based on the same plan, exhibit a partly stone stage building. "For only those parts, that had already been constructed as a permanent building, were built of stone. The"ornamental wall"placed before the stage and between the parascenions in the 4 th century must also have been still constructed of wood and cloth, since in the various dramas it must represent the buildings". The audience room was developed into a grand structure with stone seats! Thus -- Dörpfeld!

4. The buildings of the fourth period fall in the Hellenistic time, in which the prescenion was built of better material as a permanent structure, for which Epidaurus is mentioned as an example, but without sufficient certainty. The front wall consists of stone columns or half columns, whose intervals could be closed by wooden panel paintings.(Pinakes). At the middle of the wall is arranged but one doorway, yet the use of intermediate rooms with additional doors is not excluded. The height of the proscenion varies in dimensions from 9.7 to 11.4 ft. As Dörpfeld is of opinion, "this may be fixed in the time, when the houses did not average higher", and which the proscenion should represent. The explanations and the basis have little force. Yet so much is fixed, that the Hellenistic theatre only differs in monumental details.from those of the 5 th and 4 th centuries, so that in it actors and chorus still played in the same places as earlier, particularly in and beside the circular orchestra and before the proscenion forming a background. We agree with the earlier words of Dörpfeld:-- "If they were not busied on the roof of the proscenion for other reasons".

5. In the fifth and sixth periods are to be placed the theatres of the early and late imperial periods, which were required under Roman influences to experience a change in plan, when men abolished the chorus. The orchestra then became superfluous as a place for the play, and only the audience room and the stage with its proscenion could be retained, but again only with the same alterations. The orchestra was reduced in extent, the ring of slabs was omitted, the proscenion was moved nearer the spectators, when this must shrink into a low

stage scaffold, since the ancient place for the play was occupied by seats for distinguished spectators.

According to Vitruvius, it should not be more than 5 ft. h high, so that the spectators in the orchestra might be able to see the movement of all actors appearing. The proscenion became the front wall of the stage, its roof was the floor for the play, the front wall of the stage became the monumental background.of the stage, in several stories; the stage area was long and narrow and covered by an inclined ceiling. The parades remained in the ancient places, but came to lie beneath the outermost row of seats.

But one may also break out another path and say, that everything remained as in the old theatre, and that only the orchestra (besides its reductions) was excavated deeper, whereby the front walls of the proscenion must sink and receive a different form, while the rear wall of the old proscenion with the parascenion inceased to a height of even 6.56 ft. But this belongs in the domain of jugglery and alters nothing in the preceding result.

Yet much of this was already observed before the classification of Grecian theatres, and it was adhered to by all those, who did not forget that the transition from the Grecian drama to the Roman must also make itself apparent structurally, and transitions of this sort can give nothing radically novel. Such would be brought by architecture into the corresponding form, if the poetry had demanded a new programme.

But to emphasize one thing heretofore neglected, the architectural impulse in both theatres and the advance in respect to esthetics, which the Roman theatre has made as an architectural work in comparison to the Grecian. Its advantages were introduced in most Grecian theatres of the periods mentioned, besides the changed modes of playing.

The characteristics of all periods mentioned, of the 6 th, 5 th and 4 th centuries B.C., of the Hellenistic period, of the early Roman under Nero and of the later Roman under Phaidros are shown at the Theatre of Dionysos in Athens,according to the statements of Dörpfeld (p. 1-96, pls. I-V), and may be followed, and the differences be recognized, when some probl-

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problematical things must also be taken in the bargain, such as attempts at restoration in plan and elevation etc.

Passing to the details, as these still exist or harmonize together, let the orchestra be first considered, and indeed as the oldest example, that of the Theatre of Dionysos in Athens. On Palte III and page 27, Dörpfeld gives as lying 5.9 ft. beneath the pavement of the present orchestra, a piece of wall about 3.28 ft. high and 11.4 ft. long in a circular curve and built of polygonal stones, taking this as a part of the wall enclosing a circular place 79.0 ft. in diameter, which he makes known as the first orchestra of the said theatre, continuing on page 33:66 "If we could determine from the ruins the magnitudes of the orchestras of the 6 th and 5 th centuries, they would unfortunately afford us no conclusions on their arrangement for performances. No piece of the original pavement of the orchestra is preserved in its original form, and neither a foundation nor a dressed rock gives the least knowledge of an altar structure, that might have stood in the middle of the circle or on its edge". The ruins refuse the information. It is otherwise for the Theatre in Epidauros, that Dr. P. Kabbadias began to excavate and to clear up in the year 1881, and the scientific results of which investigation are published in "Praktika".(Athens. 1906). We first in the celbrated theatre building of Polycletus meet with the safe representation of an orchestra of the middle of the 4 th century B.C., according to which all further theatre structures may be deduced, and indeed justly so, as we have to do with a correct thing. The orchestra is surrounded by a circular ring of slabs 1.28 ft. wide and of hard white limestone. It lies at the same height on the pavement of the orchestra, by which is indicated no covering of any kind, neither a coating nor a covering of slabs. (Fig. 414; after Praktika. 1883. Plate 2).

The ring is placed at a distance of 6.9 ft. from the bottom circle of the lowest row of seats. The space between this a and the ring is made somewhat lower along the southern half of the circle, as a wide collecting gutter for the rain water falling from the theatre steps, which at both ends of the gut-

gutter is led through two openings into a subterranean sewer. The place for the play is thus kept dry, but is somewhat reduced by this plan.

Tangential to the circle of slabs rises the front of the proscenion, which on account of the said reduction of the orchestra by the ring of slabs is again moved somewhat nearer the spectators, but not at all as near as Vitruvius' rule in reference to the bottmo circle for the first row of seats requires.

In the middle of the orchestra lies a circular stone 2.31 ft. in diameter with a hole in the centre, which may be regarded as the foundation for a round altar, but which may likewise have served as an immovable centre in laying out the circular lines of the rows of seats.

An allied arrangement of a channel, only 3.47 ft. deep and 2.98 to 3.15 ft. wide, covered by partially perforated slabs, is found in the Theatre of Dionysos at Athens, but which does not run concentric with the base circle, whose centre is much nearer the audience room, in order to not require the stage to be placed too far back in retaining the full circular form of the orchestra.

The same"sunken passage", that separated the orchestra from the audience room, served as a collecting channel for rain water and was continued to the sea as a subterranean drain, is found at the Theatre in Eretria, where the pavement of the orchestra was coated with lime wash.

Likewise at the Theatre in Sicyon was a larger water channel, that was carried from the middle of the audience room under the orchestra and stage, conducting the rain water outside.

There was further determined a deep channel in the great T Theatre at Megalopolis, which extended directly before the seats (of honor) along the lowest row of steps.

On the contrary, in the Theatre at Oropos are lacking the channel and the passage to the rows of seats, instead of which there stand five marble thrones with inscriptions in a semicircle on the unpaved area, which limit the orchestra and make possible the circle of slabs before this to the proscenion. (Fig. 415).

Such seats of honor, also five in number, with an altar in the same circle as the seats, makes possible in the Theatre at Priene the drawing of the full circle in the orchestra. (Fig. 416). The passage between the enclosure and the ascending audience room is paved with carefully joined ashlars, 6.0 to 6.1 ft. wide, and it also served as a channel for water.

At the Theatre of Dionysos in Athens, during the Hellenistic period, the entire lower row of steps consisted of such seats of honor (Fig. 417), before which extended a passage w with a marble enclosure next the orchestra -- thus between the said water channel and the lowest step. The pavement of slabs now existing in the orchestra belongs to the latest period.(Archon Phaidros).. On Delos the orchestra had a mosaic pavement. Under the floor of the orchestra are now frequently found arched passages, that served as channels for water, but on account of their size may be designated as passages connecting the altar and the interior of the stage building, as the so-called Charon's passages. One such is still found in the Theatre at Eretria, leading from the middle of the orchestra beneath the pavement of the proscenion.

At the Theatre in Sicyon are preserved portions of a water channel beneath the pavement of the orchestra, which led from the centre of the orchestra to the hyposcenion. It exhibits for this distance a lerger cross section and may indeed have served as a Charon's passage between the two points mentioned. Likewise the Theatre in Magnesia-a-M. has such a channel, that extends from the middle of the orchestra to beneath the stage building.(4 th century and 3 rd century B.C.).

By the new excavations in Priene, on the contrary, a Charon's passage could not be determined. Earth covered the orchestra floor; neither pavement nor vestiges of any wooden construction were found.

By the structures now available, it is proved that a circle of slabs in the orchestra tangent to the lowest row of steps of the audience room and to the ornamental wall of the proscenion can be drawn, and that its diameter was reduced at pleasure by the placing of throne seats or by an eccentric location, -- when the centre of the ring of slabs did not coincide

with the basal circle. The placing of the throne seats reduced the diameter of the orchestra ring, and the eccentric plan brought the observer somewhat nearer the stage. (See ground plan of Theatre of Dionysos in Athens, Fig. 418 [1]).

Note 1. After the plate by Dörpfeld and Reisch.

The form of the orchestra is not everywhere the same. Thus for example, at the Theatre in Priene, according to Dörpfeld, it formed a circle extended to a square"(sic!), while in Thoricos it was actually the square form with angles rounded off on one side.(Fig. 419). On the other hand, in the Theatre in Priene it is slightly horseshoe shaped, chiefly agreeing with the rule of Vitruvius, just as for the Theatres on Delos, in Oropos, Epidauros, Sicyon, Magnesia-a-M., Megalopolis, Delphi and athens at a certain time. Likewise the Theatres on Sicilian soil, in Egesta and Syracuse, exhibit the more than semicircular form, as well as those in Asia Minor at Iassos, Telmissos, Aizani etc. In Assos we only meet with angles projecting somewhat more and the same form again as at the theatres in Piraeus and in Eretria. On the contrary, Aspendos exhibits a strongly Roman arrangement. If exceptions prove the rule, then Vitruvius is right, according to the examples remaining to us!

"--- Thera are things, which in regard to the purpose in both a small and a great theatre must be made of the same size, which are the steps, the concentric passages, the balustrades, -- so that no inconveniences may result". By this principle Vitruvius has again been justified by the structures!

Also in the following:-- "If for the construction any building material be lacking, marble, wood or other things, it is then not improper to omit or to add something, if it can be done with moderate reduction, the architect is experienced, has an active mind and does not lack the gift of design".

The audience room, the theatre proper, Vitruvius desires to be enclosed by a somewhat more than semicircular wall, concentric with the great circle of the lowest seat-step. This is so in Epidauros; but not in places where the conditions of t the site present difficulties. This sufficiently appears fr from the plans of the theatres of Athens, Delphi, on Delos,

in Thoricos and Pergamon.

It was mentioned in commencing, that in the earliest period the natural slopes, as they occurred, were utilized as audience areas. This simplest kind was then succeeded by inclined structures built of wood, which was indeed probable and possible, only when their former occurrence is not based on principles, as for example given in Dörpfeld (p. 100, 101) for t the Theatre in Oropos:-- "The form of the audience room is n not accurately known, since only a single semicircular wall and portions of the supporting walls have been uncovered. The Theatre can never have had rows of stone seats, since with the good condition of preservation of the thrones standing in the orchestra and of the entire stage building, the removal of all seat-steps is not to be thought. Therefore the spectators must have had wooden seats, whose traces are also to be seen plainly on the foundation walls. Hence we have here a good example for a theatre area with wooden seats, just as we must assume them for Athens in the 5 th century." These conclusions are certainly not compulsory! Was the Parthenon covered with shingles, because not a single piece of its marble tiles is found today? Of what material were the cornices on the Temple of Rome and Venus? Certainly not of wood, even if they have also entirely disappeared! [1]

Note 1. Concerning the good preservation of the stage building the said author says:-- "That parts of the walls were n not found, only extending to 6.56 ft. high, but that half columns and angle piers were still standing when excavated, but were later overthrown, when they were broken. The corresponding entablature blocks lay around on the ground. The height of the columns could not be accurately determined, but the entire height of the proscenion must be assumed at 8.2 ft. Judging from the holes behind the cornice blocks, the ceiling of the proscenion was constructed of wood. A restoration of the stage with its assured (sic) superstructure is represented on page 108, but it should be further noted in reference thereto, that the height of the superstructure cannot be determined! In what then does the good condition of preservation of "the entire stage building" consist? The proscenion in Priene affords more, as we shall see later.

To the dangerous and temporary audience room, actually no longer proved to be constructed of wood, succeeded the monumental theatre of stone. The artifically constructed stone seats were indeed preceded by those cut in the solid rock.In both cases was utilized as a building site the natural slope of the land, whereby more expensive substructures, stairways and treatment of the facade were avoided. To these statements correspond the still preserved structures.

Therefore in the stone theatre the audience room consists of a number of seat-steps, in most cases extending concentrically around the orchestra, which in ever increasing circular arcs, so far as their full course was permitted by the conditions of the building site (see the representations in Athens, Delos etc.) -- there rising as an inclined line of moderate inclination. The steps were mostly wrought from stone blocks, and they either rested on the rock prepared to receive them, (See Theatre of Dionysos in Athens, Theatres in Taormina and Syracuse, the latter, from the 5 th century B.C., after Miletus and Megalopolis was the greatest of the Grecian world with a diameter of 492 ft. and 46 rows of seats, of which the 11 lowest were covered with marble), or in special cases on coursed rubble masonry or on corbelled stone slabs, as on the Theatre in Aizani.(Fig. 420). Seats constructed of several blocks are shown by the theatres in Priene and in Magnesia-a-M.

A termination next the stage was given to the rows of seats by oblique or stepped inclined side walls, over which the spectators could look toward the stage, though not always conveniently from the corner places. These side walls extended radially in most cases, but were also placed parallel to the proscenion wall, as in Egesta. With reference to the possibility of good vision toward the stage, the rows of seats were not always extended to the inner surface of the wall, but rather in correct recognition of the conditions, a stairway was inserted. The straight and narrow stairways were arranged as needed and in accordance with the size of the theatre, not in all cases as the rule established by Vitruvius required. They subdivided the audience room into wedge-shaped divisions (kerkides), that upwards are interrupted by one or two concentric

passages (diazomata), thus forming two or three ranges in the theatre. The number of the inserted stairways is generally doubled in the upper ranges on account of the greater perimeter.

The ascent to the ranges occurred from the orchestra through the paradoi. When permitted by the conditions of the site, other separate means of access from the exterior were made p possible by ramps or by ladders to the upper ranges. (See Athens, Delphi etc.). From the concentric passages, which were enclosed on one side by a vertical wall as high as the width of the passage, separate stairways were arranged at definite intervals, that the spectator sometimes had to follow to the height of the lowest step of the next range.(Fig. 421; Aspendos, Bosra). On the ground plans of theatres in Asia Minor in the last period, the treatment of the seat-steps is simpler, and richer execution is represented by Fig. 422. In Athens were the treads of the steps roughened by grooves, to prevent the visitor from slipping, a precaution also found elsewhere on stone ramps, for example in Epidauros. The normal lowest row of seats next the orchestra, as already stated, in many places is replaced by more convenient and richly wrought marble seats with backs (Athens, Oropos, Priene); they were bestowed as seats of honor for generals, state officials, foreign and native guests of honor. Beautiful examples of such are preserved in Athens and Priene. Their seats are wrought lower at the back, indeed to afford a better hold for the cushion laid thereon or the rolled toga.

Where the steps did not end on the slope, the ending of the uppermost row of seats was formed by a simple plain masonry wall, that in buildings of the last period and erected under Roman rule was replaced by shady porticos closed externally, as completely preserved in Aspendos and practically so in Bosra. Promenade porticos affording shelter from weather were likewise arranged in the earlier period, not as organic parts of the theatre building, but as separate architectural structures in the vicinity of the theatre.(Athens, Pergamon). The unbroken external walls were coursed in great limestone ashlars without the aid of mortar and iron, either covered by

marble slabs (Aizani) or in which limestone without mortar, as in Myra and Iassos; or they appear as walls of split stone faced with marble slabs. On the Hellenistic building of the Theatre at Ephesus, also in Priene and on the side wall of the Theatre at Magnesia-a-M came into use ashlars with bosses and cut margins at the end joints, as well as on the exterior of the Theatre at Alinda. (See Le Bas.II,2; also publications of Prussian Museum on Magnesia-a-M.).

The dimensions of the space for the audience were chiefly great, in accordance with their purpose of seating a great number of men; thus for example, the theatres were:--

Aizani	183.68 ft. in diameter.
Egesta	206.64 ft.
Iassos	246.00 ft.
Cyzicos	328.00 ft.
Syracuse	492.00 ft.
Laodiceia	492.00 ft.

Among the greatest were the theatres in Miletus and Megalopolis (See Pausanias, Book VIII), the latter seating 44,000 men, while the Theatre of Dionysos in Athens seated 30,000, and that in Laodiceia could accommodate 10,000 (100,000 ?) spectators.

The most beautiful theatre is admitted to be that built in Epidauros by Polycleitos, "the most important in proportions and beauty". (Pausanias, Book II, 27).

The voices of the actors should also be loud and clearly u understood by the most distant auditors; but with the considerable dimensions and the uncovered location of the theatre, this does not seem to have been the case always.

The proposal of Vitruvius to make special arrangements in the theatres in order to increase "the distinctness of the v voices" of the actors, certainly relates to this.

Therefore in theatres built of solid materials, i.e., of masonry of rough stone, ashlars, or marble, and which material cannot resound, he desires the arrangement of acoustic vessels in the audience room, that are especially designed to increase the distinctness of the tones, which proceed outward in a semicircular form from the stage as a centre and enter

the cavities of the acoustic vessels, thus producing by a combination of sounds a corresponding harmony. He indeed states, that theatres were annually built in Rome without any attention to such acoustic vessels; he even says that none of these were to be found in Rome; but there were such in the provinces of Italy and in most Grecian cities. L. Mummius brought such acoustic vessels to Rome after the destruction of Corinth. But this arrangement is not mentioned in all ancient literature now known; only the anonymous author of the essay "De Fabularum Ludorum Theatorum Scenarium ac Scenicorum antiqua Consuetudine" mentions them. [1] In the numerous known theatres on the soil of Italy, Sicily, Greece and Asia Minor, no acoustic vessels nor even vestiges of them have been discovered. One is therefore tempted to support Texier's opinion, according to which Vitruvius indeed speaks of his own invention, which was not adopted.

Note 1. See Vitruvius' zehn Bücher über Architektur. Translated by F. Reber. Stuttgart. 1865. p. 147. Note 1.

Vitruvius prefers bronze vessels, or if there be not sufficient means to provide these, then "resonant pottery vessels;" they should be made in proportion to the magnitude of the theatre, "and indeed so, that when they are struck, they can give in the separate vessels the tone of the fourth, fifth, and the entire series extending up to the double octave". Then are a afterwards placed in small cells built beneath the seats of the theatre, in accordance with their musical order, and so that they touch no wall, have space around them, with an open space likewise at the upper open end; they should be set inverted and have wedges beneath them on the side next the stage, at least 1 1/2 ft. high; corresponding to these cells, openings 2 ft. long and 1 1/2 ft. high are left in the beds of the lower steps. The arrangement of the sound openings "in the beds of the lower steps" makes the entire scheme very problematical in a filled house.

For theatres of not too great dimensions, Vitruvius requires 13 chambers separated by 12 equal intervals, in the height of the first concentric passage. The peculiar form of the substructure of the concentric passage of the Theatre in Aizani exhibits 13 such divisions; one is tempted to assume these to

be acoustic cells (Fig. 420), since the number and location correspond to the statements of Vitruvius, and the restoration of the lacking parts may be easily made to satisfy the descriptions of Vitruvius; yet I might recognize in the division walls, cut from a single block, merely the supports of a row of seats, whose form was required by the conditions of the ground, the inclination of the step-seats, and the plan of the diazoma. The statements concerning the discoveries of acoustic chambers etc. in Scythopolis and Lyktos are now termed untrustworthy.

Vitruvius requires three horizontal series of chambers for great theatres, the first for the harmonic scale, the second for the chromatic, and the third for the diatonic scale.

The visual distances for the most distant spectators are no less to be mentioned, since they amount to&--

Telmissos	159.08 ft.
Patara	160.72 ft.
Aspendos	177.12 ft.

Yet the spectator easily comprises at a glance the orchestra and the stage, the "thymeliker" and the "skeniker" (see Fig. 423); such caricatures as the occupant of the highest row and of the front parterre in our modern theatres, in which the group of players are sometimes viewed in horizontal projection, or one may sometimes wonder at their chins and nostrils, while the foot-lights cast shadows upwards on their faces.

The stage back forms the part latest constructed, and on account of the different changes experienced by it from the 5 th century B.C. until the time of Roman rule, it is the portion of the Grecian theatre most disputed by philologists and architects. By the conclusive discoveries in Epidauros, and most recently in Priene, that have furnished us with well preserved and tangible materials for the architectural structure of the stage building and of the proscenion, more juiet has appeared. But what always busies the specialist still is the question of the moveable decorations and the place on which the actors appeared. Various statements in Vitruvius (Book VII, preface, and VIII,5) on the stage and decorative painter

Agatharchos of Samos (5 th century B.C.), on the theatre painter Apaturius from alabanda in the Hellenistic time, who in the "little"Treatre at Tralles had to paint the decorations with artistic hand, his essays in Book V, 8 and 9 on the decoraction of the stage walls and their diversity, on the coulisses (periactes), the use of scenery etc. (palace architecture, private buildings and landscapes) bring as little clearness in this matter as the statements of Servius and Pollux thereon, and upon the handling of mechanical arrangements.

Such might indeed be attained, if men were to once abandon the attempt to not apply the decorations mentioned to the great stone theatres with the permanent stage, or desire to compel this. Vitruvius expressly emphasizes, that Apaturius painted for the small Theatre in the "architecture of the Etruscans and Romans" (2 nd Edition). I intimated thereon, that for the said dispute only similarly large buildings, such as the Theatrum tectum in Pompeii, the covered Theatres in Aosta, Naples, Catania and others were to be considered, and if men would decide to take the words of Vitruvius (Book V, 7, 2) in earnest:--"That the Greeks call the stage scaffold the logeion, therefore since with them only the tragic and comic dramas are played on the stage (skeniker), but the other artists (thymeliker) appear on the orchestra -- and that the height of the stage must be not less than 10 ft. nor more than 12 ft."

Otherwise we must content ourselves with what was said [1] in an approved doctor's dissertation of the Technische Hochschule at Hanover:-- "Although a certain obscurity still rests on i its character (i.e. of the scenery) and the mode of its use, that its clear signification restrains and compels us to seek plausible explanations in the domain of hypotheses ---". But until this"certain obscurity"disappears, it has first still a good distance! And yet the writings of A. Streit [2] and of O. Puchstein [3] and others have contributed much to simplify the question, when men finally began to take into consideration the actual dimensions of the theatre and afterwards reached conviction, that in great theatres the placing and moving of colossal coulisses and curtains (the latter up to 3875 sq. ft. area) established very splendid technical requirements, and

that these were also objectionable on esthetic and other grounds, but especially also since nothing has become known to us concerning their dimensions in width and height, both of the periactes and of the background. Thus for the use of a "scene ductilis" (moveable stage),as for example Dörpfeld assumes for the colossal Theatre in Megalopolis, there is indeed no mention in the Grecian theatre of Vitruvius. Puchstein believes that a rolling decorative surface of 113.5 ft. in length and not less than 26.2 ft. high must be raised, "that this is indeed the greatest, that must be exacted from the reader of Dörpfeld-Reisch's work on the Theatre -- and on technical grounds not only opponents but also the supporters of the statements in the said book have aroused doubts"! And the position of A. Streit thereon is shown by his exeellent and beautifully drawn plates, that he has devoted to this question! They have a more drastic and emancipating effect than the most lengthy comparisons in words. To show how such decorative pieces were set up free, drawn out and in and made to vanish sidewise, stiffened against wind and weather and protected, the possibility unfortunately fails, since the necessary starting points are lacking to us.

Note 1. See Beiträge zur Bauwissenschaft. Heft. 6. Edited by C. Gurlitt. Berlin. 1906.

Note 2. Streit. Das Theater. Investigation on the Theatre building of classical and modemn nations. Vienna. 1903.

Note 3. Puchstein, O. Die Griechische Bühne. An esthetic investigation. Berlin. 1901.

Note 4. Dörpfeld, W & E. Reinsch. Das Griechische Theater. Athens. 1896.

Furthermore still remains the decision for the place of the play, which even extends into the Hellenistic period, as stated, by Dörpfeld and his followers is assumed to be in the orchestra and before the proscenion, under the significant understanding, that gods and heroes must still appear on the proscenion (on its roof). This theory is also not very exclusive!

O. Puchstein and his pupils on the contrary only permit the actors on the roof of the proscenion, that by them is assumed and asserted to be the floor of the playing stage. For this

indeed may be mentioned a passage of Plato:-- [5] "Very forgetful must I then be, O Agathon, Socrates said, since I have seen your trustworthiness and highmindedness, when you ascended on the Okibos [1] with the actors, and you looked over such a great multitude of spectators, when you spoke your part without being disturbed in any way". Consequently the man either stood like a god on the roof of the proscenion or like a comedian on the boards of the stage! According to the evidence of Lucian, the bad tragic and comic actors were driven down from the stage and not from the orchestra; an actor, who had to play an insane person, threw himself down from the stage and sat down below in the midst of the senate before two men of consular rank.

Note 5. Feast 17. p. 194 B.

Note 1. The "okibos" was introduced by Eschylus. The word occurs frequently. Now Nero in Lucian permits the actors to ascend to the "okibontes". (Lucian. Nero. Chap. 9, p. 64).

Further information is afforded by the vase paintings, but only by those on vases from lower Italy. On about 18 different ones is represented a players' stage, that appears as a roughly wrought wooden podium. Three or four posts support a board floor, up to which in certain cases leads a flight of 4 to 8 steps, (Fig. 426), but not on others. Instead of posts also occurs white painted stumpy Doric columns. The drama is played before a background decorated by Ionic columns. Likewise the front wall of the proscenion does not remain without ornamentation, which consists of suspended fabrics, garlands and the like. With the Apulian "phlyake" stage may accord the description of a Spanish village stage., that runs as follows, according to A. Streit:-- "Thus Cervantes says of Lope de Ruada (about 1550 A.D.), who was both poet and actor and wandered from place to place; the stage consisted of four benches forming a square, on which were laid 4 to 6 boards and thus was about 4 hands higher than the audience area or the ground. To the stage then still belonged the old woolen curtain, drawn sidiwise by two cords, behind which stood musicians, that say romances without the accompaniment of the guitar".

"The essential part of the play occurred on the stage, yet as the Chiron vase shows, all sorts of little jests might be played on the steps to the stage".

The problem now is to occupy one's self with the actually existing structures and distorted by no restorations, in order to fall into a rigid decision, such as O. Puchstein expresses against those believing otherwise, when he says:-- "It appears to me that what Dörpfeld and Reisch have placed before us in their books are mere conjectures, produced on the ground of entirely different and quite uncertain materials, and then powerfully enforced on the ruins 6p. 24); and then he hurries to the conclusion;- "What a long chain of mere conjecture and unskilful combinations"!

First the ground plan, where it is premised, that it concerns two buildings of unequal height, that according to Puchstein "together form one organic structure", that indeed cannot be doubted from the architectural standpoint. A low front structure (the proscenion) only 9.7 to 13.1 ft. high, that in extent exceeds but little the diameter of the orchestra a and otherwise has but a small depth. Behind this a two-story building of the same extent but with greater depth, the stage structure. How the latter appeared in elevation originally or even in a later time, we know not; but it is hoped in no case as it is represented in the books on theatres by the two contending authors.(See views of theatres by Dörpfeld and by Puchstein; Figs. 425, 426).

The designation of the low front building by the word "proscenion"is proved by the inscription found in Oropos, also against the designation of the high building by "stage building", i.e., the booth in which the actors remain and prepare, there is nothing to recall.

The front structure has exits toward the orchestra, the two-story rear building has entrances and exits from the street in the ground story, and others toward the audience room, the terrace roof and to the interior of the proscenion. -- How the proscenion appeared at the time of its erection, we can recognize from the architectural parts now partially standing in Epidauros, Oropos and particularly in Priene. Of the upper

story of the stage building in Oropos there are only scattered remains found, but in Priene several courses of ashlars a are still to be found in place.

It is to be noted here, that O. Puchstein terms Dörpfeld's proscenion a logeion; both employ the word"stage"for the two-story rear structure.

As little as the orchestra or the audience room had the same accordant form in all existing theatres, just as little is t this the case for the stage building ("the stepped stage"). In proof of this, let the following theatres be mentioned.

1. That on Delos (See Puchstein, p. 54), where a rectangular plan of the stage 47.5 ft. long and without divisions, accessible outward by a doorway from the rear, was the basis. Three doorways on the facade wall were assumed. How the interior was covered and where it received light is unknown. The front wall ("ornamented wall") of the proscenion consisted of square piers and projecting half columns, while the three free sides of the stage building were surrounded by porticos on piers.(Plan, Fig. 427). Corresponding to the latter, balustrades or walls must have extended around in the upper story, where the doors were arranged to correspond to those in the ground story. There is assumed the detached stage building with peripteral pier and column porticos in the ground story, which supported a terrace roof. The entrance doorway toward the orchestra had the jambs adjoining the front angle pier of the portico.

2. In Priene the stage building consisted of three rooms lying beside each other and about 8.2 ft. high, that had doorways toward the prosgenion, but only one main entrance doorway from the street. Daylight entered these rooms through several slits in the external walls, 5.9 to 7.9 ins. wide. What was completed on Delos is but partially executed in Priene, where only the front portico with a row of piers with attached half columns were finished, by which only for two intercolumniations of such is assumed at the end. The entrancesto the orchestra are arranged in the same manner as for (1); the height of the jamb (doorway pier) is fixed at 12.2 ft., thus rising above the height of the proscenion formed by the front portico,

whose length of 60.4 ft. corresponds to the diameter of the basal circle. The three openings in the front wall and on the rear side of the stage building are each 3.47 ft. wide and 6.6 ft. high, thus corresponding in dimensions to about our modern normal single doorways. Of the upper story walls built of ashlars, there yet stand three courses with a total height of 3.6 ft. at the western end and also four courses at the right jamb of the doorway, which led to the upper hall.

3. At the Theatre in Assos, the continuation of the porticos at the ends is omitted. The prefixed row of piers with half columns only extends as an "ornamental wall"of the proscenion, projecting but little at right and left beyond the stage building, that consists of three adjacent rooms, connected together by doors and only accessible from the front by three separate doorways. The piers of the paradoi doorways adjoined at right angles the angle piers of the front proscenion wall. (Plan; Fig. 428).

4. Ifthe pier-colonnade at the proscenion of the said Theatre and also that in Oropos (plan, Fig. 415) always constructed in one plane, we see this abandoned in Epidauros, where at both ends are arranged projections of 3.28 and 6.56 ft. w wide and the columnar facade terminates, which indeed appears to proceed only from esthetic feeling and not from a technical necessity; they have no purpose.

No starting points were found for a daylight lighting of t the great proscenion interior, where the contrary is not expressly stated.

Passing to the superstructure, there are first to be considered the theatres in Epidauros, Oropos and Priene. It is certain for the proscenion in Epidauros, and it consists of a m marble front wall, adorned by 12 Ionic half columns, while t the projections at the front corners are ornamented by three-quarter columns with quarter columns at the reentrant angles on square piers. The columns bear the conventional Ionic entablature, consisting of the architrave, plain frieze and dentil cornice, that is broken around the projection. The panels between the column-piers measure in the clear 3.94 × .85 ft., thus being little larger than are normal doors to living rooms.

The elevation from the plinth to the top of the cornice is 11.8 ft. high. What stood behind this is only preserved in a few ashlar courses of the structure. [1]

Note 1. Kabbadias, P. Epidauros. Athens 1900. Pl. 72, and the same in Praktika. Athens. 1906.

6. In Oropos is determined the same marble wall, but which is only 8.2 ft. high to the top of the cornice. The eight half columns, the two angle piers and the entablature are of the Doric order (Fig. 415); the openings between the supports are 3.46 × 6.56 ft., thus being somewhat smaller than those at Epidauros. The walls of the stage are built of poros ashlars and still stand upright to 6.56 ft. Columns and entablature of the proscenion are made of white marble and still stood at the excavation. They were later maliciously overthrown and thus were partially broken in fragments. [2]

Note 2. See Dörpfeld, W. & E- reinsch. Das Griechische Theater. p. 102. Athens. 1896.

On the architrave over the colonnade stands the inscription&- "Agonotheas to proscenion kai tous pin(akas", by which this wall was designated as the proscenion. For the assumption, that this was the rear wall for the actors, the small height indeed remains conceivable; but the diameter of the orchestra here amounts to only 40.6 ft. to the outer edge of the ring, while it measures 78.7 ft. in Epidauros, and the playing floor would be only 3.92 ft. wide for a logeion, if the stage were carried high.

Furthermore, neither in Epidauros nor in Oropos was the depth of the logeion made according to the rule of Vitruvius; in both cases it must have been executed according to thb sketches in Fig. 429.

Of a further dedicatory inscription on a Doric architrave with peculiar ends like consoles, there were three fragments found, that must have belonged to the stage, [1] whose height above the proscenion could no longer be determined, wherefore the attempt at restoration lacks an assured basis. The two console-like blocks of the architrave permit Dörpfeld to assume an opening in the upper story of the stage and toward the audience room, from which one could step out on the roof of

the proscenion. But this does not explain the great width and singular form of the opening, the author of the sketch restoration states, -- but still he alone has discovered the "singular form and the opening"! Then he permits soaring persons and especially gods to fly through this "singular opening", discovered by himself, on to the roof of the proscenion, thus explaining; "If the crane (on which the god was fastened) was somewhat lowered, then the person sank (stretched out horizontally ?) down to the roof of the proscenion (it was not much to sink with the opening assumed at 9.85 ft. high, if one assumes that the person came on his legs and not on his belly), and standing on the podium, he could speak to the actors and spectators below." (Thus in the orchestra). Since the gods were also colleagues to the artists, then will the terrace r roof be conceded, in its signification as a logeion. This is yet further developed:-- "Likewise one conceives, that it was technically necessary or at least useful to give a smaller span (in this free length) to the beam over the opening (that is here a part of the triglyph frieze) and the crane, that s should be borne by the curved architraves (where then are such -- or are meant by this the console-like corbel blocks?).

Note 1. See Döppfeld, W & E. Reinsch. p. 102, 108.

For the form shown is to be freared rather a breaking of t the consoles, than that one should count on their aid to receive the load. [2]

Note 2. Balcony supports and corbels for door and window lintels, as they are taken to be independent members in stonecutting. In setting them, as a rule care is taken to protect the end of the beam from any pressure, just as one also seems to protect the edges of the abacus of the capital from any l load by the scamillum. The widely projecting and disk-like capital of the early Doric style certainly did not aid in reducing the "clear span" of the architrave !)

For the restored view of the stage at Oropos (Fig. 42 in h his work), one will therefore only hold its author responsible.

6. At the Theatre in Priene, entirely built of marble, all supports of the front wall of the proscenion still stand upright; 12 in front, 2 on the east and 1 on the west sides.

Ten of the front supports are formed as piers with attached half columns of the Doric order, the two angle supports and the three at the ends being square piers.(Fig. 430). Only n nine capitals are wanting, but instead there is still in the eastern third the entire Doric entablature, resting on the uninjured piers with the half columns of the same form known in Assos and Oropos. Under each fourth triglyph is found a support. The total height of the proscenion amounts to 8.9 ft., thus again being about 0.65 ft. greater than that of O-ropos.

The mass of the detail forms of the entablature are designated in the splendid publication of the Royal Museum at Berlin as "varying considerably", while this measures but 6.56 ft. The cornice blocks measure 6.05 to 6.26 ft. ft. in the thickness of the wall, which does not here come into consideration, either technically or esthetically.1

Note 1. Priene. Ergebnisse der Ausgrabungen und Untersuchingen in den Jahren 1895-1898 von Th. Wiegand und H. Schrader. Berlin. 1904.-- A solid and model publication in the domains of archaeological research and for the history of architecture.

But not only are the detail forms produced by the stonecutter well preserved, but their painting can still be determined. The capitals and shafts of the columns were purple-red, as w well as the taenia of the architrave, the triglyphs were light blue, the metopes were colorless (white), the mutules were b blue, and the vias and cornice red, the various egg-and-dart mouldings being blue and red.(See p. 247 of the work). Therefore the entire superstructure is assured in its forms and i its extent, as well as the doorway jambs at the paradoi (see the distant photograph, Fig. 227, in the work) and also the rear wall of the proscenion or the front wall of the stage -- as one prefers -- with its three doorways, while the upper story of the latter only remains in a few ashlar courses, of which the editors of the said publication say, that they can state nothing certain in regard to the architectural treatment. The Roman rebuilding of the theatre is of no importance here. Free play is here left to the imagination, and it has made use of its right. At the two ends of the proscenion

roof, 9.0 ft. deep, according to Puchstein being the floor of the stage, were marble balustrades 3.05 ft. high, one of which still remains in place and is remarkably diminished upward in thickness. (0.75 ft. at bottom and 0.65 at top, and 3.11 ft. in length (Fig. 430)).

The balustrade standing outside (W) is terminated at the upper edge by a band 2 ins. wide and projecting 0.79 in., the inner side being thicker at the front, like an ante.

The former existence of a similar slab on the eastern side is ensured by dowells and marks of setting. The editor recognizes in this, excluding all doubt, "a low side balustrade", which is so far interesting, since thereby a way to the roof of the proscenion is closed at both ends, and such would be only possible, either by a doorway in the front wall of the stage, or by the intervals between the angles of the stage a and the said balustrade. Puchstein (p. 50, 52) says on the contrary, "that these marble slabs might form the base of a high wall, which enclosed the stage at the right and left to the top, analagous to the Roman "versures", so far completing the parascenion at each side." The authors of the work on Priene protest the contrary (note on p. 250) and state, "that not without the strongest technical objections could one advise the acceptance of side walls and add thereto:-- how then could a single pier in the lower story support the load of a two-story (sic !) wall?" If this were the only ground for objection, then might one be quiet, for in the first place, there can be no mention of a two-story wall, and secondly, i its weight is transferred to two rectangular piers (2.18 × 1.64 and 1.48 × 1.48 ft.), so far as one can measure, that = 2.18 sq. ft. in cross section. The walls in question were 9.85 ft. long, required no greater height than 19.7 ft., having the given thickness of 0.82 ft. That may be constructed without technical objections, if one only takes care that the stones spanning the piers be so arranged and dimensioned, that they do not break -- and that is possible, since they h have clear spans of but 7.3 ft., while without any special the architrave at the middle intercolumniation of the Propyleion in Athens has a free span of about 19.7 ft. and has to

carry an entirely different load.(Also see the cross beams of the north portico of the Erechtheion with 19.7 ft. free span). The wall has a volume of 159.0 cu ft. with a weight of 24,800 lbs. (156 lbs. per cu. ft.), so that a sq. in. of the section of the pier, and as an average, was only loaded with 64 lbs! Yet where there is nothing, the emperor has lost his rights, and so may the two assumptions remain for a time.

On account of the destruction of the stage of the Theatre in Magnesia-a-M., we are relieved from every need of being compelled to take part for or against the views of Dörpfeld and of Puchstein. The editors of the likewise excellent work on Magnesia [1] say (p. 23, note 1):-- "As for the restorations of the stage building proposed by Döpfeld and by Puchstein it is to be remembered, that the ruins afford no sufficient basis for them. The stage structure is destroyed, excepting some few remains of the foundation walls, but they show five rooms beside each other".

Note 1. Berichte über die Ergebnisse der Ausgrabungen der Jahren 1891-1893 von Carl Humann. Berlin. 1904.

Concerning the spacing of the piers with columns, it may be further mentioned, that this in nowise corresponds to the sc scheme of the great temple architecture of the Doric and Ionic styles, but are rather similar to the arrangement of the columns in the public porticos. For the theatres in question are given the following numerical ratios.(See sketch, Fig. 431).

Epidauros	c d = 1 1/2 times a b.
Oropos	c d = 1 1/2 times a b.
Priene	c d = 1 1/8 times a b.
Delos, portico	c d = 1 1/2 times a b.
Magnesia, portico	c d = 1 1/2 times a b.
Delphi, portico	c d = a b.

While for the different temples are given the following approximate ratios:--

Parthenon, Athens	c d = 2 1/2 times a b.
Temple Zeus, Olympia	c d = 2 times a b.
Egina	c d = 2 times a b.
Selinus	c d = 2 times a b.
Paestum	c d = 2 times a b.

Corinth	c d = 1 4/5 a b.
Artemeseion in Magnesia	c d = 3 1/3 a b.
Temple Zeus, Sisipolis	c d = 3 a b.
Temple Zeus, Aizaini	c d = 3 a b.
Erectheion, north portico	c d = 3 1/6 a b.

Therefore the actual length of the architrave remains relatively small in relation to the other proportions, being 4.43 ft. in Oropos, 5.74 in Epidauros and 5.91 in Priene. On the other hand, the cross section of the stone supports is very liberally dimensioned for what they have to support. With t the given stone material could one build lighter, were it not that the form would play the chief part for this architectural portion.

Another important question is:-- were the openings of the intercolumniations open or closed, and in the latter case,how? They could be closed partly by movable doors, -- a middle and two side doors -- partly by special forms or panels, termed "pinakes". Marks of arrangements for fastening frequently appear on the piers, by means of which the proof may be produced, that such closing panels were in use. That at a certain time the stage and the proscenion were entirely constructed of wood, before men proceeded to execute them in stone, must be believed, but is here scarcely of importance. According to the evidence of inscriptions, the wooden proscenion on Delos disappeared in 269 B.C. The manner of the completion of the change, how wooden posts became stone piers and ceiling beams were architraves, the framed panels became closing panels, requires further thought; all that was already invented!

And self-evident conclusions require no profound expressions.

According to O. Puchstein, W. Dörpfeld should have recognized in an "acute"way, that the said paneled closures were always of wood in the Grecian period, even when the other parts of the stage were constructed of stone. For doors, i.e., for doorways, wood was indeed also employed for the closure in a antiquity, even when the door jambs were made of stone. If by "pinakes"are to be understood thin wooden walls in the intercolumniations, to be set in place or removed, or if one wishes to assume in their place movable triangular prisms with

painted decorations, then is this permitted to any one, but not proved. The grooves in the stone supports strengthens the opinion that closing panels were there inserted, but do not tell of what kind.

The editors of the work on Priene desire to determine with certainty the former pinakes by the grooves in the piers, and they say that in all intercolumniations, with the exception of those lying opposite the three doorways of the stage, such existed. Excepting the doorways, these pinakes may later have been replaced by "thin mortar walls", as the traces of mortar on the piers indicate. In the"most western"front intercolumniation has been preserved such a masonry pinake to a height of 1.64 ft., which in black-white-red colors on a yellow ground exhibits a painted double door, which is proved by three plain vertical stripes extending to the ground. [1] In any case an ingenioas piece of decoration on an "ornamental wall", which consisted of three wooden doors and eight painted on the plastering between purple-red columns! Why these fragmentary strokes of the brush must correctly indicate doors is not shown. Might they not be just as well indications of a balustrade or of something else?

Note 1. See representation on page 255 of the work for an incorrectly shown architectural enclosure of the proscenion, which is there drawn 11.5 ft. high, while it actually measures but 8.9 ft. Where scales beneath the figures are necessary, they are omitted; the said incorrect ones are superfluous.

In a related dissertation [2] edited by C. Gurlitt, it is preferred to fill the intercolumniations with decorative pictures instead of doors, which according to need stood before a tragic or comic stage, and were changed according to the corresponding scheme. This was made possible by porticos, coursed ashlars or by windows, trees, mountains and caves.(Fig. 432).

Note 2. Beiträge zur Bauwissenschaft. Heft VII. p. 51. Berlin. 1906.

Whether these decorations were less than the natural size, as large as the double doors of a modern living room, would have been very effective in the wide interior of the theatre, may be left undecided.

To now assume that the intercolumniation was filled with joinery -- with painted masonry in mortar, or with rotators, and that the proscenion had a tight roof, it must be asked f for what purpose the rooms under the said roof and behind the ornamental wall were intended? First indeed as an anteroom for the actors awaiting their cues (if the play occurred before the ornamental wall), since their dressing and decoration indeed took place in the ground story rooms of the stage building, lighted by some holes in the walls. But those also had to receive the mechanical arrangements, that were necessary for the vanishing and appearance of personages. Yet the people must still see somewhat at their part, i.e., have light and indeed daylight from outside. If the intercolumniations were closed by boards nailed on or by plastered walls, this would have been ended; so much the more since from the stage building behind light could only sparingly enter the front building. But perhaps this would also be sufficient for the eyes of the natives of the south, in the intense sunshine of the south. Also perhaps not, for otherwise would the front walls of the Roman-Grecian Theatre at Aspendos, Termessos and Sagalossos have been furnished with windows.! [1] In Aspendos are 5 openings , each 3.61 ft. high, in Sagalossos 3.61 ft. high and semicircular at top, that could not alternate with doors, but which would have had little sense at the transformation of the stage. On account of the small height of the podium and not to recall the echo of a wooden architecture, alread: vanished 400 years earlier, were columns scorned for the decoration of the front wall, for which was assumed in Athens a very effective figure frieze.

A. Streit prefers the assumption of transparent decorations in the intercolumniations, painted on cloth, that at least made possible the advantages of easy changes and transmission of light into the machinery room or the waiting room. To leave the doors open during the play, the openings for the pinakes closed by a parapet wall 1.64 ft. high (analagous to the remains at Priene), with a free view through all openings to a continuous painted background, as for example in a certainly somewhat different form -- not in conception but in execution,--

Palladio carried out in his Theatre Olympico at Vicenza, [2] appears to me most acceptable, both technically and artistically. It would likewise permit combination with many Pompeian theatre sceneries! Mechanical apparatus was placed behind the painted movable backgrounds, that were suspended at a distance of about 3.28 ft. behind the rear of the front wall of the proscenion, so that the actors could still pass before them.

Note 1. See C. Lanckaroronski, G. Niemann & E. Petersen. Städte Pamphyliens und Pisidiens. II. Pls. 13, 18, 19. Vienna. 1896.

Note 2. See Streit, A. Plate VIII.

The rotating, naive, puppet-show decorations placed in strips 3.28 ft. wide directly between the columns then vanish. But in particular and complex cases one must place some according to the judgement of the manager. And then as now would one of these gentlemen have arranged the scenery better than another. The traces found on the arrangements for closing t the pinakes therefore need not be neglected, for during the time that no play occurred, the openings would have been kept closed for various other reasons.

Likewise the stone proscenion, during the play and also besides this, was furnished with a permanent ceiling or roof. Grooves and other traces, for example in the courses of the still remaining stones, indicate a ceiling of wooden beams with a board covering. If the beams lay parallel to the front wall, they must have found further bearings on girders, if t they lay perpendicular to the front wall, then girders were superfluous, for they were supported at one side on the stone ornamental wall, and the other on the stone wall of the stage building. For the small depth of the proscenion with a distance between centres of 2.46 to 3.28 ft., the beams required a cross section of 5.9 × 7.1 ins. and a thickness of 1.58 to 1.97 ins. for the board floor.

Dörpfeld-Reisch state in speaking of Oropos:-- "The ceiling of the proscenion, according to the holes remaining behind the cornice blocks, consisted of wood and was horizontal. It formed a podium, but that was not directly connected with the orchestra, which one could enter without ascending from the

paradoi".

In Priene we still have tangible evidence. Corresponding to the front wall supports, there extended marble beams from the proscenion wall to the stage building, that on one side were bedded on the ashlars of the triglyph frieze, and on the other rested on an ashlar course 1.00 ft. high of the stage building.

The stone girders were 1.61 ft. wide .nd 0.89 to 0.99 ft. high, and they are arranged on two sides for bearings 2.36 ft. wide, on the upper surface being but roughly cut, so that this rises about 1.58 in. above the top of the cornice. The wooden beams on the girders thus lay parallel to the proscenion wall and with about 5.25 ft. clear span. Their cross sections were made small for a distance of 1.97 to 2.30 ft. between centres. Since the boards must extend over the rough tops of the girders, then the floor came to lie higher than the front edge of the cornice and special arrangements were required. Whether the floor was then inclined forward can no longer be determined, but it is probable. If no mechanical apparatus or decorative parts in the substructure were to be protected, then might the floor sometimes be laid down only when in use, then being again removed and stored away. The application of a pavement or even the addition of a tile roof in the manner of the houses, that the proscenion should represent, still 9.8 to 13.1 ft. high, appears to be excluded. The arrangement of traps on the rough floor, if these could be proved, would certainly require the wooden or board floor.

For Puchstein the ceiling is the stage floor, the logeion or pulpitum; "Dörpfeld prefers to designate it as a roof, indeed as the flat roof of the houses represented by the proscenion, and Reisch concludes that the flat roof imitated a tile roof after the reality". To act on this was no pleasing imputation, even for gods, but was still less acceptable for ordinary mortals. That is the "contested point"on which men will not agree.

Goethe once wrote to the professor of philosophy Bachmann in Jena:-- "The connoisseur of mankind should convince himself, that no one is convinced by the reasons of his opponent. All arguments are merely variations of a first fixed opinion, on

which our ancestors so wisely said:-- 'Never dispute with one who denies your principles.'"

And now in conclusion:-- since gods, i.e., men representing them, were not always let down from the window of an upper story on the roof by means of a crane, and also orators could not be brought before the people in this way, then must a natural method be left open for them. And this may be determined from the ruins. The roof of the proscenion or the floor of the logeion could be reached by ramps or stairs. In Epidauros are arranged beside the paradoi two doorways, one of w which led to a ramp and the other into the orchestra. Gods and men thus did not come into collision with each other; both had separate ways for the former to reach the house roof, for the latter to appear on the sidewalk before the house. So much is given by the reality!

This purpose was otherwise attained by a stairway, as may still be seen at the Theatre in Priene. A stairway with 12 steps is arranged at the end of the stage building, and of which 6 steps are still preserved, leads to the roof of the proscenion. But according to the words of the editor of the cited work on Priene (p. 245), these were not in the original plan. "The decision to add the stairway was matured during the construction, which one may see on the architrave of the proscenion, and also that the doorways in the upper story were not later additions. They were projected, when men were working at the height of the architrave".(Sic -- who was there?)

In Oropos and Eretria the orchestra was sunk so deeply, "t "that the pavement of the paradoi at its outer beginning was level with the floor of the upper story of the stage building. In Eretria a high floor was actually the ancient pavement; in Oropos it was constructed by filling in and by retaining walls. (See Dörpfeld-Reisch. p. 105).

But Puchstein also will have ramps in the theatres in Magnesia, Pompeii, Sicyon, Megalopolis, Delphi and Athens.

The ruins instruct us and this chiefly amounts to:--

"The pinakes were portions of a supporting wall furnished w with doors, that was formerly constructed entirely of wood, and therefore was divided into supports and panels. In course

of time the wall was seized by a petrifying process, so to speak, that first affected only the supports, with the ceiling on the beams. The stone supports took the form of columns with a corresponding ornamentation of the entablature. The stone supports resisted petrifaction during the entire Grecian period. The entirely stone proscenion belongs to the period fo transition from the Grecian to the Roman style".

These are the simply honest words of O. Puchstein, to which I must here restrict myself according to my observations at the different places. Everything elsewhere presented -- "is the expression of individual taste", which no one can deny, but by which the facts in the history of art will not be affected in the least.

According to what has been developed, opinions on the original forms of the audience room and of the orchestra do not diverge, nor do these on the actual form of the proscenion with its means of access (ramps and stairs), and also the belief is everywhere adopted, that we know nothing of the structural form of the upper story of the stage building.

Variations on the theme already exist by reason of the gaps, and since they have an awakening effect, will lead in certain cases to truth and knowledge.

Dörpfeld and his followers still permit the gods to appear on the proscenion roof, the actors on the contrary being in the orchestra in common with the chorus, and they regard the ornamental wall of the proscenion as the playing wall (background ?) in the theatre, whereby the objection that the thymelikes anf the scenikes were covered at the same time, it w was sought to remove on account of a picture (Plate XIII) in the Theatre at Eretria, in which a number of men stand around in straight lines, but as the participants in a drama never stood.

To utilize a theatre building, as he desired to do at the Thersilion in Megalopolis as a background for a drama with a suspended cloth background, is to be rejected for technical theatrical and other reasons, as well as the intermediate structure of the fabulous scenothek with its stone threshold tracks for moving the great wooden frames covered with cloth.

A drastic perspective view of the peculiar design was furnished by A. Streit.

O. Puchstein, contrary to the views of Dörpfeld, places the chorus in the orchestra, refers the scenikes to a covered podium with parascenion, to which ramps or stairs led up. On the other hand the gods continue to dangle or disport themselves with mortals on the boards of the podium.(See view of the stage of Epidauros in the attempt at restoration, p. 1, Figs. 425, 426).

New discoveries, more finds and more thorough study will indeed bring "more light" here also.[1]

Note 1. On the theatres in Sillyon, Perge, Aspendos, Side, see Niemann & Petersen. Städte Pamphyliens und Pisidiens. 1. Vol. 1. Vienna. 1890. p. 51, 70, 102, 147; plates 14, 20-27, 29, especially the beautiful restorations of the stage building of Aspendos (by G. Niemann on Pl. 27). On the Theatre in Pergamon, see Dritter vorläufiger Bericht über die Ergebnisse der Ausgrabungen von Pergamon u.s.w. p. 40 et seq.Berlin. 1888. A rich list of dimensions of antique theatres is to be found in Müller. Bühnenalterthümer. p. 4 - 14.

A contribution to the fulfilment of this pious wish was recently attempted by the highly gifted A. Mau, who died meanwhile, induced by the great Theatre at Pompeii, of the time preceding or at the beginning of the tufa period (200 B.C.), of which furthermore only the audience room is made known, but the existence of the stage is termed probable.

About 100 or 80 B. C. is made credible the erection of the now destroyed stage building"in the oldest form", with one f facade and three doorways at the ground levell between "oblique-angled"parascenions. (See plan in his book). Behind the facade is given a stage hall (in reality a passage 6.56 ft. wide and 55.7 ft. long -- 6.56 ft. is no depth for a hall!), which men reachedfrom the exterior through five doorways. As interesting additions were mentioned 6 water basins of different sizes, of circular and square ground form, within the orchestra, that according to the section drawn, still exist beneath the pavement of the orchestra. What they had to do with the building is not further stated.

Further is the foundation of a constructed oblique parascenion wall at the right side of the plan (plate 11 of his work); the one on the left side is purely conjectural. Both together are assumed to be carried up high in the restored ground plan, which is designated as the "oldest form of the stage building". [1]

Note 1. See Mitt. d. Kais. Deutsch Arch. Inst. Röm. Abt. Vol. 21. 1. Rome. Dec. 1906.

A ground plan, but without the oblique parascenion, "yet in acceptable dimensions", especially of the actors' hall, that is made at least 14.8 ft. deep and actually fits the foundations discovered, is given bu Puchstein (p. 75) with the note, that"in spite of the Roman rebuilding the Grecian stage in Pompeii is still easily recognizable".

That a Grecian stage was erected at the place mentioned even in the time of Sulla or shortly before, after Rome had already possessed for a century its stone theatre (185 B.C.), that had to be tory down again as a piece of luxury, but instead in 55 B.C. received under Pompey its splendidly built stone theatre -- is still scarcely credible.

About 80 B.C. -- the time when Pompeii received its colony of Roman veterans -- or even only in 40 B.C. followed a transformation of the stage building, after it had existed for 20 years or even for but a few months, if one assumes the given limit of 80 B.C. In this the (oblique ?) parascenions (which were and are properly a characteristic of the Roman theatre) were omitted, for the construction of a raised stage for the entire length of the building, and of the great side entrances, retaining the narrow passage behind the facade of the stage. About 1 B.C. was erected the stage facade with three doors and with rich architectural treatment, which must indeed harmonize. These procedures were thoroughly described in more than 50 pages of text, wherein it is added on the occasion, that a proscenion front wall was not impossible; that other things "might be, but were not so"and that "some things also remain obscure".

A. Mau believes, that the contested question, whether 100 or 80 B.C. the play occurred in the Theatre in Pompeii in tha

orchestra (Dörpfeld) or on the roof of the proscenion (Puchstein), cannot finally be answered at Pompeii, which may well be accepted.

A. Mau holds it to be very slightly probable, "that men acted before a proscenion between the two pilasters flanking the opening of the orchestra (see plan) or even before the proscenion extending between the parascenion fronts in the orchestra". (p. 53, Sect. 4), in order to come to the following conclusion on page 4:-- "All this may be conjectural possibilities, but not proof. But now when all these suggestions speak for the playing in the space between the parascenions, but against the playing on a stage contained in even this room, it appears only to remain unnecessary for the drama to occur in this room, but on the level ground. There was no proscenion, and then men would designate any decoration placed before the stage facade as a movable proscenion".

"There I stand now, I a poor fool,-- and I am as wise as before"! That in certain pieces some role bearesr had to play on a logeion Dorpfeld-Reisch grant; but on the contrary in P Pompeii it is now placed high and low on the sidewalk, in spite of the fact that men were already so reckless 250 years earlier in the mother country, and kept apart the different actors according to their rank, and even furnished the higher ones with broad and convenient ramps for ascending to the proscenion roof.

The Mittheilungen present no more architecturally, than what is already suffciently known, at most that the circumstantial details, so poor on the actual monuments and so rich in mysteries, just as in the book on theatres mentioned, still has a disturbing effect. "Everything alive from the living" -- but the results in Pompeii afford nothing, that may take form.

Allied to the theatre, both in purpose as well as in the stepped arrangement of the audience room is the Odeion, intended for the presentation of oratorical and musical pieces.

No odeion, as a permanent structure, appears to date earlier than the era of Pericles, at least in Athens. According to Plutarch (Perikles 13), "it had in accordance with its internal arrangement many seats and numerous columns. The roof w

was steeply inclined and terminated in a single apex. The whole must have been a representation and imitation of the tent of the Persian king. Pericles likewise had supreme control here.

"There comes Zeus with sea-onion head, Pericles
And bears the Odeion high upon his brow."
(Kratin. Thrak.).

"To earn honor thereby, Pericles now for the first time caused the introduction of a musical contest at the Panathenian (festival), and himself as a chosen judge of the prize, arranged how the different parts should be performed on the flute, by song, or on the lute. And as then, the Odeion also later continued to be the place for musical contests".

It was burned during the war with Mithridates, but was rebuilt again by king Ariobarzanes II (62-52 B.C.); it is now gone from the site without a vestige.

The statements of Plutarch agree with those of Vitruvius concerning the form of the structure; columns of stone and over it a wooden roof, of the masts and yards of ships from the Persian booty.(Book V, Chap. 9).

Pausanias (Book I, 20) confirms the statements of both; "Near the Sanctuary of Dionysos and the Theatre is a building, that must be an imitation of the tent of Xerxes. But it was built a second time, for the earlier one was burned by Sulla, when he conquered Athens".

Although the statements of the purpose of the structure are entirely clear and undoubted, the defective remarks on the form of the building leave great opportunity for the play of the imagination. Yet we find allied designs of a later time preserved, which may supply a representation and data for the restoration of the earlier ones.

Philostratus (Vitae Sophistarum II, 5) states that Herodes Atticus built a "theatre" for the Athenians in honor of Regilla, whose ceiling was of cedar wood; which was likewise remarkable in sculptured work,i.e., on which wood was excellent carving, a structure, whose like was not to be found elsewhere in the Roman empire. [1] He also built for the Corinthians the "covered theatre", indeed much inferior to the Athenian, "but

which was till one of the few elsewhere remarkable".

Note 1. See the attempt at restoration, a sketch by Tuckermann in Baumeister. Vol. 3. p. 1745.

The structure in Athens (160-170 A.D.) remains in its principal parts; indeed the name of odeion was not always applied to it (but theatre or covered theatre, see above); but it must have been used in accordance with the directions of Pericles.

The plan is allied to that of the great Theatre; the audience space is constructed in steps in semicircular form, divided in sections by narrow stairways and separated by a concentric passage. The orchestra was somewhat larger than a semicircle, but contained no altar, according to all writers. The stage, five steps higher than the orchestra, was separated from the andience space by the paradoi and originally had a richly arranged monumental architecture with the usual three doors. Behind the stage wall was further a great vaulted hall, right and left of which rooms and stairways extended through three stories.

The entire building was built of massive ashlars; the outer walls with great round-arched openings still remain, as well as the stage and the lower portion of the rows of marble seats, and also the pavement of the orchestra, with its white and p pale green marble (cipolline) tiles.

The room could contain about 6000 spectators; covering it with a wooden structure without columns must have been difficult for a theatre about 253 ft. in diameter, which could only be accomplished by leaving a portion open as a skylight, (which could be closed), whereby the span was reduced. Vertical support by posts in the concentric passage would have s solved the difficulty in the simplest manner, as at the Theatres in Pessinus and Syracuse (traces of the tent bars on the middle concentric passage), when instead of the problematical skylight, high side lights through the windows in the semicircular enclosing wall are to be assumed.

Remains of such odeions still exist in Akrai (Sicily) beside the large Theatre, in Aperla (Asia Minor) in the vicinity of the acropolis, and in Pompeii, as well as elsewhere. The rear wall and rows of seats are cut in the rock in Aperla; the

orchestra had a diameter of 19 ft., around this being only 6 rows of seats upwards. The most important cities must indeed in time have been adorned by such odeions, which were also u used in the late period for the sittings of courts and assemblies of the people.

As the largest in all Greece after that at Athens, Pausanias (VII, 20) mentions that in Patara. The former was not specified by him in his description of Athens, but was added in the Book "Achaia","since Herodes had not then commenced the structure, which surpassed all others in magnitude and beauty.".

By Niemann and Petersen was published in 1892 two other odeions in Termessos and Cretopolis (See Städte Pamphyliens und Pisidiens. II. p. 98-99. Vienna. 1892). The walls in Termessos still stand to the height of 32.8 ft. The plan is approximately square,(80.0 × 81.0 ft.), and the walls are 3.28 ft. thick. A band cornice divides the external walls into two stories, of which the lower is entirely plain and the upper is partially animated by Doric pilasters. In the eastern and southern walls are arranged altogether 11 rectangular windows. (Fig. 433).

The form of the main cornice cannot be determined with entire certainty. That found beneath the ruins of Cretopolis is essentially smaller; it seated only 200 persons, while the one in Termessos could receive 600.

Likewise in Epidauros was one determined within the Gymnasium from the time of Roman rule, and its remains were properly drawn and published. (Praktika. 1904, 1906. Pl. A, 1). Rectangular in ground form with internal segmental rear wall., podium, orchestra with its mosaic pavement, and the segmental stepped structure for the audience are preserved.

The podium, that was surrounded on three sides by walks 11.8 to 12.8 ft. wide, was entered by three doorways of the background. Behind the segmental enclosing wall of the audience room is constructed a corridor with stairs, behind which adjoin 4 to 6 small rooms.(Fig. 434).

After Pomtow (Delphika. II. p. 69 et seq..Leipzig. 1909), H. Thiersch would also designate the tholuses as "music halls", where the open tholos "with a domical roof as a sounding board"

would be termed the natural precursor of the enclosed music building.

"The great round hole in the centre of the circular structure (the Tholos) at Epidauros might be the place for the construction of the wooden podium, and further the channels found beneath the pavement might be the cavities of the so-called labyrinth for strengthening the sound"! (Fig. 93, our drawing of the foundations).

DIVISION XI. BUILDINGS FOR GYMNASTIC SPORTS AND E EXERCISES.

Stadion, Hippodrome, Gymnasion, Palaestra and Baths.

The stadion was the course intended for racing contests, long and narrow, semicircular at one end, rectangular at the other. There were stepped seats for the spectators along the long sides and around the semicircular end, as in the theatres and odeions. The judges of the contest occupied special places between these, opposite to whimh in Olympia was erected a marble altar of Demeter, from whose steps a priestess of the goddess looked upon the contests. (Pausanias. VI, 20).

The appelation of "stadion" for the race course must have been derived from the most famous one in Olympia, which was exactly a stadion or 600 Greek (Olympian) ft. in length, and it indeed served as a model in plan and arrangement for all others.

The rounded portion (sphendone) was not used for races; the course extended only as far as the straight side; projecting antes (sphenes) at the beginning of the curved portion, or s shafts of columns set between the parapet walls marked the end. The starting place was at the rectangular end.

A system of drains was arranged for keeping the course dry, which was covered by thin slabs and earth, and whose vestiges are still preserved in Athens. The course was separated from the spectators by a parapet wall, behind which was placed an entrance, which was 5.97 ft. wide in Athens; the public entered there to pass from thence to the seats. This entrance could also be drained by a masonry drain beneath it, which received and removed the rain water flowing down from the seats. The pavement of the passage was one foot lower than that of the course; the parapet wall rose 5.38 ft. above it and above a foundation wall of the same height; then followed the rows of seats, divided into sections by narrow stairways. (Fig. 435).

For the judges of the contest and the competitions, a separate entrance to the course and the seats was arranged. Pausanias (VI, 20) desigates this as the so-called covered passage in Olympia, which was also rediscovered by the German expe-

expedition. For the same purpose was also the subterranean passage 12.45 ft. wide found at the Athenian stadion, whech terminated with the arena of the curved end.

As for theatres, natural slopes were also mostly chosen as locations for the stadions, between which the course was excavated, as in Athens, to thus obtain cheaply and conveniently the substructure for the seats; or this latter was formed by simple banks of earth thrown up, as in Olympia, or was entirely built of stone masonry, as in Delphi (Pausanias, X, 32), or composed partly of stone masonry and partly of natural earth slopes, as in Messene. Marble seats are mentioned in Corinth, Delphi, Athens etc. Porticos were carried along the upper row of seats in Messene and Aphrodisias; at the latter place the stadion was semicircular at both ends, a form of plan already belonging to the late period, as well as the course in Laodiceia, which according to an inscription, was later changed into an amphitheatre. As in the theatre, the space for the audience had to accommodate the maximum number of men, while the number of the built rows of seats could nowhere be as great as in the theatre. The Stadion in Perga therefore had only 17 rows of seats, that in Aizani only 10, while Aphrodisias shows 26; Aizani seated 12,780 men, while 50,000 found room in Athens. The dimensions of the still best preserved stadions are not very different, for those of the arena are:--

In Athens	109.4 ft. wide and	671 ft. long.
In Aizani	152.0 ft. wide and	725 ft. long.
In Aphrodisias	98.4 ft. wide and	745 ft. long.
In Olympia	105.0 ft. wide and	691 ft. long.

Only scanty vestiges remain of the Panathenian Stadion on the left bank of the Ilissos; the slopes, the ruins of the walls, and the cleared pavement of the arena readily permit a restoration of the whole. No more beautiful location for the purpose could have easily been chosen and utilized, than is found there. The end is placed parallel to the course of the river and was decorated by a portico with columns or a portal, opening toward the great stone quarry lying on the longitudinal axis of the stadion, and afforded access to the public.

The first building was erected by the orator Lycurgus (350 B.C.); Herodes Atticus supplied it with seats of Pentelican marble about 500 years later. At the cost of king George of Greece, the ruined portion of the semicircular end was merely rebuilt by the German architect Ziller, thereby fixing the exact forms of the plan and of the details.

Since the Olympic games have been again revived in a somewhat changed form, the stadion has been rebuilt in the ancient form and most splendidly in white marble and put into use.

The most famous of Grecian stadions, that in Olympia, that seated 40,000 to 50,000 men, was uncovered by the German expedition in 1879-1881 in its most important parts. The course proved to be a long rectangle of about 702 × 105 ft., surrounded by sills of poros stone. Around this rectangle at a distance of 3.28 ft. extended a water channel with several basins, from which fresh water could be taken during the games. The slope of the Kronion hill was utilized for the northern portion of the space for spectators; artificial embankments were necessary for the southern and others. The seats for the public were of woodwork. At each end of the course is a limestone sill, which supported wooden posts at equal distances, separating 20 starting places. The exact distance from one starting point to the other between centres is 630.65 ft. The eastern wall terminates the course in rectangular form, and not in the semicircular form used elsewhere. From the Altis the Stadion has but a single direct access, near which stood the Altars of Hermes as the protector of the contest and of the Demon of the favorable moment, to warn the contestants, "that yet all result lay in the hand of the deity", and on the right of the passage rose as a warning the bronze statue of Strafzanes. [1, 2]

Note 1. Instead of 702 ft. is given also 690 ft. Baumeister. II. p. 1104.

Note 2. Ausgrabungen. IV. p. 50, pl. 38; V. p. 24, pls. 36, 35; also Funde. p. 21, 22.

The Stadion at Delphi was so arranged, that one longer side lay on the slope, the other being constructed by a retaining wall built of polygonal ashlars, while the arena was produced

by filling in the semicircular end is still well preserved. The southern longer side has 6 rows of seats. At the entrance end stand 4 heavy piers, which are connected by semicircular arches, before which lay the enclosure limiting the course. The length of the course was 585 ft.

The Stadion at Epidauros, given by Kabbadias in his work " "To hieron tou Asklepion en Epiraurei", Athens,1900, exhibits a plan with rectangular ends at the east and west sides. The half tone plates at page 104 of the work give information concerning the condition of the stadion and the rows of seats.

In Priene (see Priene work, page 258), the Stadion was built together with the "lower Gymnasion". It is a late Hellenistic work and consists of course enclosures like gateways, the audience area, with a Doric promenade portico above this. The length of the course amounts to 627 ft., and a part of the r rows of seats is still preserved. Figa 436 gives the ground plan of the so-called lower gymnasion with the stadion, which were connected together by a doorway.

In the fourth preliminary "Bericht (Report) der königliche Museen" on the excavations at Miletus, Th. Wiegand (died in Miletus in April, 1906) published information on the Stadion at Miletus. This was furnished with an entrance portico 74.5 ft. wide, that consisted of 2 rows of 8 arches each with Corinthian columns spaced 9.45 ft. on centres. Only the middle one is wider, being 12.5 ft. The architecture of the arcades was measured by Architect Zippelius (Carlsruhe) and published in the Report mentioned. It cannot be placed earlier than in the 3 rd century A.D. In its plan the gateway of the stadion has great similarity to that at Ephesus. The length of the course is about 820 ft. The northern wall of the parados with a vaulted entrance and the remains of the adjacent seats lies detached from the audience area. The total width of the facade of the stadion was 242 ft. (Fig. 437 gives the ground plan of the entrance portico of the stadion, after the drawing in the Report mentioned, page 22.).

The Hippodrome was the race course for horses and chariots. Its general arrangement and form was similar to the race course for toot races; but length and width had to be greater,

in order to have room for placing the row of horses and chariots.

Therefore the Hippodrome consisted of the level race course (dromos), divided along the middle by a simple bank of earth into two halves of unequal length (see Pausanias), terminating at one end in semicircular shape, at whose centre stood the goal, about which horses and chariots must turn. At the opposite ent was the starting place for the horses (aphesis), which in Olympia had the form of the bow of a vessel, "that extends its prow into the race course". Each of these starting places, in which were built the places for chariots, had a length of 400 ft.; they ended in a portico, the so-called portico of the Agnaptos. Exactly at the middle of the prow of the vessel stood an altar of sun-dried bricks, on which sat a bronze eagle with outspread wings; before it on the vessel's prow was a bronze dolphin on a balanced beam.

When the signal for starting was given, the eagle was raised on high, so as to be visible to the assembled spectators; the dolphin was lowered to the ground. The rope stretched b before the places was then dropped, so that it fell first for those next the agnaptos; then the charioteers started, "so that those in front on the ship's prow were in line with each other. Thenceforth came the test of their own skill and of the swiftness of their horses".

A passage terminated at the longer side of the race course, which was carried beneath the place for spectators (as in the stadion); on this stood the Taraxippos, the terror of horses, in the form of a round altar, which frightened the horses.In Nemea, this as a red stone, "that shone like fire", formed t the turning point of the course.

On one goal stood a bronze statue of Hippodamia with a fillet in her hands. The adjacent conjectural plans (Fig. 438) of the Hippodrome in Olympia by Hirt and Visconti give an approximate idea of the arrangement, but do not entirely correspond to the otherwise not very coherent text of Pausanias.

The plan of the Hippodrome in Pessinus (Fig. 439), with its arrangement of the race course, the form of the starting place, and of the spina extending along the middle, is of the later

period or of Roman origin. But the connection of the theatre and race course remains interesting, which may have its model in the long terraces arranged with the theatre (Pergamon and Aegai).

The space for spectators, composed of step-like rows of seats, as in the stadion and similarly divided, also lay on natural slopes or were constructed of earthen embankments. (Olympia).

Gymnasions and Palestras are often of equal importance. O Originally and strictly understood, the latter was the place for contests in pugilism and with the rings. The stadion and hippodrome being the places intended for the performance of the national games, so were the gymnasions the places for the exercises preparatory thereto; they were included among those public establishments in which Grecian youths received the chief branches of their training, the development of physical strength.

The earliest gymnasions must be regarded as simple places for exercise in the open air, shaded by groves of trees, later enclosed by walls, as Pausanias describes them at Elis. (VI, 21). There in the archaic Gymnasion in the city of Elis, where the athletes performed their exercises before going to Olympia, was first placed within the walls of the different race courses, separated from each other by plane trees, one intended for running, the others for competition in the five contests; also the Pletherion, where the judges of the contest paired together those of equal age or equal skill. Adjoining these longer rooms were built smaller ones; the exercise place for competition with the rings (the palestra proper), and when skilled in the exercise of the rings, they further exercised in fights with the softer thongs on the hands. From its form this room was termed the "Square". An other place was likewise enclosed by walls and was called " "Maltho", from its soft floor; it was opened to the youths during the festival period. Two bronze statues of boys in t the form of contestants in the five combats decorated the entrance to the Maltho. Altars of Hercules, of Eros, and of Demeter, were probably set in these places.

In the Gymnasion at Olympia were found places of exercise for the five contests and for running, in their vicinity being a smaller and separate room for men with the rings.(Palestra), outside of the colonnade along the eastern wall, thus facing west and south, the barracks of the athletes.(Pausanias. VI, 21).

According to the excavations of the German expedition, the Palestra in Olympia was a square Doric court with columns, 184.4 ft. along the side, surrounded by chambers and rooms like porticos, to which two columnar portals (prostasis) led, with two columns between antes of the Corinthian order. The court served for exercises and had in its northern part a peculiar pavement of grooved slabs. The columns of the hall were of the Ionic order, so that all three orders occurred in the building.

In the deep rooms toward the north is thought to be recognized the Ephebeum, and beside this the Elaothesion and the Conisterion; a room on the east was the "frigida cavatio", from its basin for bathing. Other rooms for indeterminate purposes were furnished with stone benches.

The Palestra in Pompeii of the Oscan period may be mentioned as another example.

Of the Gymnasion, only one southern portico of the Palestra, the beginning and end of the eastern portico, 690.5 ft. long, were excavated, together with the Propyleion lying between the two, in whose vicinity lie ruins of the Roman Baths. (See plan of the Altis). This Gymnasion was not an enclosed building like the Palestra, but an extended place loosely surrounded by Doric porticos. The eastern portico was in two aisles, had a length of 688.8 ft., and it is regarded as a roofed stadion used in bad weather. [1]

Note 1. See Ausgrabungen. Vol. †. p. 40, plates 38-40; also Funae. I-III.

In one of the gymnasions in Elis was also found the council house of the Eleans, called "Lalichmeion" after the builder. "In the same were given free addresses and literary works of all kinds were read. Shields were hung up around it, though merely for ornament and not for warlike use". A building er-

erected in the Gymnasion at Mantinea (Pausanias, VIII, 9) was farfamed for its beautiful stones and contained a hall with statues of Antinous and paintings.

We see in the rooms of the gymnasions arrangements for intellectual and physical development combined together, equally distinguished under a roof and by magnificence. The originally simple enclosed room becomes a richly treated architectural whole by the addition of the porticos mentioned, and by t the connection of the Lalichmeion.

Not much more remains of these extensive and magnificent structures of the late period for intellectual instruction a and physical exercise; only ruins in Athens, Ephesus, Magnesia, Hierapolis, Alexandria-Troas, etc., still prove their existence, splendor and extent; the two best preserved ruins in Ephesus and Alexandria-Troas correspond nearly to the requirements of Vitruvius, even if they are not shaped after the same model.

According to Vitruvius, gymnasions are "not customary in Italy"; therefore he merely gives a programme arranged according to those in Greece, and he accordingly requires colonnades around them, the courts being of square or elongated form; three of these simple, the fourth facing south or opening to the south, but doubled, so that the rain might not be driven into the interior; also with three colonnades were to be spacious additions (exedras) with seats for philosophers, speakers, hearers and friends of scientific efforts; with the doubled portico in the middle was to be the hall for youth (ephebeion), a very spacious addition furnished with seatr and about one-third longer than broad; on the right of this, the hall for sack fighting (korkyreion), where the sack of sand hanging from the ceiling was struck; beside it being the dusting room (conisterion), where the ring fighters sprinkled themselves with dust after the anointing, then in the corner the cold bath (lutron); but on the left of the ephebeion the unguent room (elatheseion), and a fresh bath adjoinind this, opposite to which is the vaulted sweat bath (twice as long as broad) with its heating chamber, also a "laconic hall" and opposite this the warm bath.

Externally (adjoining the rear of the complex structure were described, according to Reber), Vitruvius requires three porticos, that contain places for contests, one, the northern, doubled like the southern and to be of considerable width; the two others single, so that they should have along both sides next the wall and columns, raised footways, the central space being lower, so that the colthed spectators might find room on these footways and not be inconvenienced by the oiled contestants. The athletes could also exercise here in covered rooms during winter. Such a portico was termed a "xystos". This and the double portico were surrounded by shrubbery and promenades, adjoining these being a greater stadion with a space for spectators.

Therefor the Vitruvian structure consisted of two adjacent portions; what was required in the first can nearly be provided in the Ephesian plan; combine therewith the Vitruvian northern and the so-called double porticos with that required on the south, omitting from the latter the xystos, the promenades and the stadion, then will the second portion by Vitruvius be likewise completely included within the limits of the walls.

The Baths in Assos have suggested that the two types of gymnasions of Alexandria-Troas and of Ephesus were likewise baths. The plan of the former has been published by Koldewey,[1] from new measurements. (Fig. 440).

*Note 1. In Mitt. d. Kais. **Deutsch** Arch. Inst. Athen. Abt. p. 45. Athens. 1884.*

Since unguent rooms occur in the plans of gymnasions, also cold baths, dressing rooms etc., and washing basins were also placed in one of the large corridors, so that nearly all rooms required in the baths likewise existed here, it would not be difficult to take one for the other, especially since data f for the arrangements of both are so limited still. Yet the arrangements at Assos and Alexandria-Troas do not entirely c conicide, and it is therefore believed, that in the latter place other methods of bathing existed, which were indeed somewhat more complex, but had not reached the full refinement of the Roman imperial Baths. [2]

Note 2. Koldewey. p. 46.

The former gymnasiums in Ephesus and Alexandria-Troas are therefore to be considered as baths and as intermediate betweeen Assos and the Roman imperial Baths. This indeed seems the more credible, since a difference is scarcely to be found between the gymnasion and the baths, and the belief further prevails, that we must see in the imperial baths an amalgamation of the native Italian baths with the arrangement of the palestra of the gymnasion or of the gymnasion itself.

No Grecian city can be conceived without a gymnasion; larger cities could exhibit several of them. With the progressive and general development of physical exercises, and with the custom of the men to take an active part in the sports of the youths, and to devote a portion of their free time to this, it became a necessity of Grecian life.

The lower Gymnasion at Priene consisted of a great court surrounded by columns, that on two sides showed only plain walls as enclosures; on the third side lay three small rooms and a propyleion with antes; on the fourth side was an added second portico, behind which lay five rooms. The connecting doorway toward the Stadion lay within one colonnade, that had no rooms behind it. (Fig. 436).

The Gymnasion at Delphi had a columnar portico 656 ft. long and an arrangement of baths. That at Epidauros was distinguished by its beautiful plan and the good proportions of its masses. The double portico recalls that of the Gymnasion at Priene; of good effect are the two-aisled hall and the splendidly built propyleion on four columns and the ascending ramp. Seats, lecture hall and stone benches for the pupils are yet preserved and peculiarly impress the visitor. Fig. 441 gives an idea of the plan, after Kabbadias, with my sketch of the arrangement of the school in Fig. 442.

There are further to be mentioned:-- the Gymnasion in Eretria (Jour. of Archaeol. XI. 1896. I Series. 153), the circular building in Olympia (text volume II. p. 105, Figs. 59,60), the so-called Theokoleon, the Baths at Oiniadai. (Marquand, Greek Archatecture. p. 327. New York. 1909.

Sea and river baths for invigoration, warm tub baths for

cleanliness, were already mentioned by Homer. With increasing luxury, the custom of warm bathing became more widely extended; bathrooms were arranged in the private houses, and "balnearia" were built for the great public, either kept by the state or by private speculators, in which visitors bathed together in great basins, employiyg sprinklers and basins of all kinds for pouring on the water etc. Figs. 443 [1] and 444 represent these baths after the vase paintings, one for men and the other for women, in which sprinklers and pouring are to be recognized. A partially preserved room in the Athenian Dipylon for washing the feet still afords a vivid representation. Otherwise little has become known of the architectural arrangements of Grecian baths. That in Assos is the only larger Greek bath certain at this time. [2] This shows as the chief apartment a portico about 16.4 ft. wide and 223 ft. long, in which stood the great basin for water, whose bases were found. This was only intended for washing, pouring and sprinkling, as represented on the vase paintings.

Note 1. Reproduced from Baumeister. Vol. I. p. 242, 243.

Note 2. According to Koldewey in Mitt. d. Kais. Deutsch A Arch. Inst. Athen. Abt. Vol. IX. p. 44, 46. Athens. 1884.

DIVISION XII. MARKET-PLACES, STOAS, BULEUTERIONS, PRYTANEIONS AND LESCHES.

Agora and Stoa. For the earnest business assembly of the men served the market or agora. This was originally no arbitrarily chosen place in the city, but was the natural centre of the locality, "a conveniently placed depression in which different ways met." Such a market-place might under some circumstances become the nucleus of a growing district, [3] as may be observed in all modern settelments. From the scattered farms and farmsteads, men came together for purchase and exchange on a neutral ground; thus arose those stores of goods, places for refreshment, inns, shops etc. Goods and men required protection from the weather, wind and sun; the portable, simple tents and booths became fixed huts and houses, t the first period of a city community. The originally scarcely fenced, leveled and perhaps paved place, for whose consecration were provided sancturaries, was gradually surrounded by business houses, porticos, and administrative buildings, and was adorned by monuments.

Note 3. See Curtius, E. Ueber Märkte Hellenischen Städte. Arch. Zeit. 1848.

The Greeks arranged their market-places in square form with spacious and doubled porticos; they decorated these by closely set columns and stone or marble beams and placed passages above the ceilings, writes Vitruvius (Book V, 1-1); and Pausanias likewise says concerning the market in Elis, that it consisted of separate porticos intersected by streets, the southern being built in the Doric style and divided in three parts by colonnades. One of the Market-halls in Megalopolis was the "Myriopolis", another was called "Aristandreion" after its builder, and a third was the "Philippic", adjoining which was a fourth and smaller one, in which were arranged s six rooms for administrative purposes. In the midst of this market was a walled sacred precinct, before which stood a bronze statue of Apollo 12 ft. high. In Argos, the Sanctuary of Athena Salpinx , a structure of white marble, was placed in the middle of the market; the centre in Pharae was decorated by the stone statue of a bearded Hermes; in Antikyra was

a fountain-housa supported by columns. The Eleans also sode horses in their market-place.

With an increasing assemblage of people in large cities, one of the original purposes of the market was dropped, and a special place was chosen for the treatment and discussion of public occasions. (Compare Athens and Megalopolis, where there was a special,council hall, the Thersilion, that accommodated 10,000 Arcadians in an assembly.

Everywhere that a democratic state developed freely, the market-place became the scene of great activity in art. To the porticos were added aqueducts, groves of trees, as well as exhibits of art works. In cities of later growth, the earlier accidental and irregular plan of the market-place was abandoned, and this was made a part of the plan of the city in accordance with a definite scheme.

According to Pausanias (Book VI, 24), it appears that it was the Ionians, who introduced the improvement; "the Market-place in Elis is not arranged according to the same plan, as the mar ket-places in Ionia and the neighboring Greek cities, but in the older style".

The remains of Ionian market_places exhibit a rectangular or square arena surrounded by porticos. Nothing longer remains of market-places in the Grecian mother country; in Syracuse, an unfluted column in a cultivated field marks the Agora, once so magnificent, more data are afforded are afforded by some cities in the islands and the cities of Asia Minor.

The Market-place in Aegae Ssee the perspective section by R. Bohn in text volume 4, page 39, of the Pergamon Work, from which Fig. 445 is taken) still appears as an extensive ashlar structure of three stories, 2,0.17 ft. long and 37.5 ft. wide, with a transverse wing 88.56 ft. long. Two of the stories lay beneath the pavement of the terrace on which the building stood, while the third rested thereon as an isolated structure. One longitudinal wall and transverse walls at distances of 14.1 ft. subdivided the lower stories into small and nearly square rooms with doors and windows, above which was placed the two-aisled portico, opening in front. [1] The comparison of this Market-place with that in Pergamon exhibits a striking concurrence of the two. A third quite similar and tolerably preserved design

of this kind at Demirdji-Deressi in Caria is published by Le Bas. [2] Fabricius [3] gives further conclusions relating to the latter, which is usually designated as appertaining to the antique Alinda. In Aphrodisias stood four double porticos, that were internally decorated by columns of the Ionic order, 460 in number; marble seats invited one to rest.

Note 1. Compare Bohn & Schuchardt, p. 15 -27, Figs. 13.26.

Note 2. In Voyage Archaeologique etc. Vol. 2. Plas. 4, 5. Paris. 1848.

Note 3. In Bohn & Schuchardt. P. 27-30.

The City Market-place and the State Market-place in Pergamon lay on terraces surrounded by porticos, connected by ramps and flights of steps.

The Market-place of the upper city was enclosed by small booths, before which was placed a portico.(See Pergamon Work, Vol. III, pl. 32).

Besides the porticos belonging to the market-places or to the theatres, others likewise occur, that only have the purpose of furnishing the people with covered and shady promenades and public walks for decorating streets or squares, also employed for consultations, addresses or readings, the Stoa, which was generally raised a few steps above the pavement of the street.

The oldest were of no great depth, enclosed on one side by a wall, with the colonnade toward the street, above which extended the horizontal entablature, like the described stoas of the temple, furnished with a stone or a wooden ceiling, which was again protected by a shed roof.

Thus the Corcyrian portico in Elis had two colonnades, one of which was turned toward the market-place, but the other was turned from it. In the midst between both, columns do not extend (which was generally the case), but a wall, to there support the ridge of the roof". It was also covered by the gable roof of the temple.(Compare Pausanias. VI, 24).

The Portico in Thoricos corresponded to what Pausanias held as usual, so that this should be considered as a Stoa.

The southern Portico of the Hellanodices on the Market-place in Elis was divided in three parts by (two) colonnades; in Piraeus was a Portico with five colonnades; the Stoa of Attalos

in Athens (Fig. 446 a, plan according to Mylonas), had along the rear wall a large number of small rooms for shops or money-changers, just as at the Agora in Antiphellos.(See Adler and Texier). Likewise in Ephesos was found a Stoa near the Odeion. The excavations of the Austrians there in the autumn of 1908 brought to light before the Odeion the ruins of a Hellenistic Ionic portico 22.0 ft. long, whose capitals agree with those represented in Fig. 282; volute capitals with bull heads projecting from bolsters. In the most beautiful manner are these results collected and reproduced by W. Wilberg in the Jahrb. d. Oest. Arch. Inst, Vol. 12, 1909. After these, the corresponding Fig. 446 b is a very interesting example of an Ionic portico from the end of the 1 st century B.C., in which the attempt is made "to animate by novelties the traditional forms of architecture." The axial distances of the columns is 15.8 ft. and their height may be taken at 23.0 ft. The Stoa of Attalos was in two stories, according to Vitruvius' statements, the lower with Doric and the upper with Ionic colonnades. From the inscription on the architrave, it was founded by Attalos II of Pergamon (159-138 B.C.), and it formed a very long structure 367.36 ft. long and 63.96 ft. wide. A colonnade divided the lower story of the portico into two aisles, while the upper was constructed in a single aisle. The lower portico opened on the side of the Market-place and 45 Doric columns supported the upper story, while the roof rested on 22 unfluted columns decorated by bell capitals. (Figs. 447, 448 [1]). The height of the ancient balustrade of the Stoa of Attalos is at l least 19.68 ft. lower than the stylobate of this portico; the northern wall of the latter was therefore built as a high retaining wall and was always visible. Stairways must have led up to the high raised place before the portico. [2] Pausanias a also mentions such stoas in Piraeus and two porticos before t the gates in Athens leading to the Keramicos; also in the Ceramicos itself, the royal Portico, "where the king sat in judgement, i.e., one of the archons, who for a year was colthed with the office, which was termed kingly". For this Lange [1] has attempted to make the form of the basilica credible, this being a three-aisled plan with raised central aisle. In refe-

reference to the Stoa in Epidauros, see the sources mentioned below, [2], and concerning the Portico in Pergamon, see the work cited below. [3]

Note 1. Compare Zeit. f. Bauw. 1882. Pls. 52, 53; also Fig. 243.

Note 2. See Mitt. d. Kais. Deutsch. Arch. Inst. Ath. Abt. Vol. XVI. p. 252. Athens. 1891.

Note 1. In Haus und Halle etc. Leipzig. 1885. p. 66-104.

Note 2. Praktika. 1885. Pls. 1, 2.

Note 3. Altartümer von Pergamon etc. Vol. II. p. 40. Berlin. 1885.

Before the portico frequently stood bronze statues of famous men and women (compare Athens); the walls in the interior were in some cases decorated by historical paintings; such a Stoa on the Athenian Market-place with such pictures was called the "gayly colored" (poikile).

One of the finest may have been that in Sparta known by the name of "Persian Portico", "which was built with Median booty, and in course of time was enlarged and beautified; on its columns stood Persians in white marble, among them being the statue of Mardonius.

The length of these porticos was usually great, as shown by the substructure of the Stoa of Eumenes between the Theatre of Dionysos and the Odeon on the southern slope of the Acropolis in Athens. The latter was over 328 ft. long, and the formed had a length almost twice as great.

By the excavations of the Archaeological Society in Athens in 1877, the Portico was proved to be 534.64 ft. long in two aisles and 52.48 ft. in width. A large portion of the limestone foundations of the external longer side are preserved, and also the square limestone bases of the inner row of pillars and portions of the rear and side walls, around which extended below a base slab of Hymettos marble. [1]

Note 1. Compare Köhler & Zitter. Mitt. d. Kais. Deutsch Arch. Inst. Ath. Abt. Vol. III, p. 147, pl. 7. Athens. 1877.

In two aisles and partially in two stories is also the Portico mentioned in Epidauros, in which the free pillars in the ground story have octagonal sections with echinus-like projecting capitals to receive pillars and entablature.

The Agora or Market-place in Priene was enclosed by connected potticos on the east, south and west, that included an area of 247 × 152 ft. The excavation (Priene Werk, p. 185), according to Schrader, so unusual is the condition of preservation, has given us the first distinct view of a great and richly treated Hellenistic city market. The architecture of the porticos belongs to the Doric order. The depth of the portocos averages 19.0 to 19.7 ft., and that of most of the rooms in the eastern and western porticos, from which they are alone accessible, a averages about 15.75 ft.

The southern portico of the Market exhibits thin marble walls 8.1 ft. high between the columns, that must have afforded protection against northern winds. The northern portico has Ionic columns in the interior, that aid in supporting the ceiling and roof. A low promenade is not placed before this. An example of the Ionic columns with unlike volutes was formerly in the Pergamon Museum in Berlin.(Fig. on p. 199 of the Werk). According to the evidence of an inscription, this two-aisled portico served as a state place for "grand banquets in connection with the city festivals".(See ground plan of the Market in Fig. 204, after Plate 2 of the Priene Werk).

The Agora in Magnesia-a-M (Publication of the Royal Prussian Museum by Humann, Kohte and Walzinger. Berlin. 1904),exceeded in size the designs in Cnidos, Aphrodisias, Pergamon and Priene, and it only remains inferior to that in Miletus.[2] It measured 325 ft. between the front columns, or 312 × 618 or 617 ft. The plan on Plate 3 of the Magnesia Work is similar to those of the cities already mentioned:-- Doric order on the external facades, Ionic in the interior, the latter supporting the ridge of the roof. The western portico had an enclosing wall with a gable on the front with 4 windows, that had wooden closures, adjoining the wall being a spring-house. (Fig. 117 on page 112 of the work). Notable is also an esthetic sculpture, a marble Nike in life size, that supported the end of the ridge purlin, and an Ionic capital there, that was decorated by bull heads on the side bolsters. The Market was indeed also ornamented by statues, resting places, fountains, and yet other architectural works, that served for general pur-

purposes, as the example for weather indicators and sundials, of which may be mentioned the so-called Tower of the Winds or more correctly the Horologium of Andronicos Cyrrhestes from Cyrrhos in Syria, built of Pentelican marble about 100 B.C. in Athens. It was designed to support a weather vane anf to receive a sundial and water-clock. It is an octagonal building of average height and with an internal diameter of 23.0 ft., that on the northeast and northwest had porches with two columns, adorned by pediments, toward the south being an apsidal semicircular projection. The eight sides of the building are directed toward the principal winds, and on each side above the crowning moulding of the wall is carved a soaring figure, that in very mediocre work represents the wind corresponding to that side. The heads and wings of these figures are composed of several slabs and intersect in an awkward manner the architrave mouldings. The apex of the roof is ornamented by a movable triton, who indicates with a staff the direction of the prevailing wind.

The lines for the sundial still remain, cut below the reliefs. The cornice is stumpy and rude in form, and the cyma is ornamented on each side by three lions' heads.

A channel conducted the water from the spring Clepsydra to the circular projection, that contained the water reservoir. The vestiges of the water clock are still visible on the floor. Beside this monument are still remaining the arches made of a ashlars, which were formerly regarded as belonging to an aqueduct to the little building, but which according to later researches, belonged to a separate structure. The arches are not built of voussoirs; the small span and the marble of which they are constructed, quarried in great blocks, indeed permit the omission of the usual construction of the arch. They are cut from rectangular blocks of stone, yet not in a complete semicircle; with plain soffit and decorated by archivolts profiled like an architrave; a rosette adorns the spandrel, a motive that Bramante loved to use in the Renaissance. Above these a arches were an architrave and a cornice, portions of which yet remain in place. [1]

Note 1. On various pieces belonging to this, the remains of inscriptions have been found, which refer this building to the

imperial period, soon after Augustus. See Dessau. Mitt. d. Kais. Deutsch Arch. Inst. Ath. Abt. Vol. 7. p. 398-400. Athens. 1882.

The piers are treated in a peculiar manner, for on the front surface and in accordance with the archivolt resting thereon, an ornamental subdivision is arranged at their centres. Here the sides are no longer parallel but diverge; the separating portion is cut with a broken surface in order to make possible an intersection of the returned profile of the cap of the pier. (Fig. 450).

The interior is subdivided in its height by two richly profiled cornices (Fig. 451), a plain band course supporting the upper columns at the angles, and an architrave band above this; the ceiling is composed of 24 inclined stone slabs, that lean against a central block. Columns and antes at the entrances have no bases; but the enclosing wall has one, consisting of apophyge, fillet and torus. The antes are not connected with the masonry, but are set against it; the capitals of the antes exhibit in their remains the same, or a form allied to that of the capitals of the columns, a row of acanthus leaves with sedge leaves extending from them to the top of the bell. The execution of both is rude in comparison with similar capitals found at the Theatre of Dionysos. The shafts of the columns are fluted, but those of the antes are plain. Only a short portion of an ante still stands, as well as two portions of the shafts of columns extending to the height of a man; the jambs of the doorways still remain, but the capitals, architrave, cornice, and the pediments of the portals are entirely detached from the building and are in great part destroyed.

The walls are built in courses of marble slabs 1.67 ft. thick and of various heights, and are still in good preservation, with the exception of some cracks. The setting bosses left in the flutes of the columns have already been shown. The architrave and frieze of the portals are bonded into the wall; the pediment merely abutted against it. How far iron was employed in this fixing can no longer be determined in the present condition of the monument. Two steps of the stylobate are still in place and to be seen; the third is covered by the soil.

Fig. 450 gives a part of the internal cornice; Fig.452 is the ground plan of the little structure, and Fig. 453 is a portion of the external frieze with water spouts.

The Buleuterion in Olympia consisted of two oblong halls separated in two aisles by a colonnade in the middle and ending in semicircular form toward the west. These two wings on the north and south joined a square central structure and a common vestibule of the Ionic order. Each wing rests on a stylobate in two steps, and their ends open with 3 Doric columns between antes, whose interspaces had grilles. Separate doorways led from the aisles to the apse divided into two halves. The internal columns supporting the structure of the roof were not fluted. (See plan of site of Olympia).

On the south wing, the regulas and mutules remained without drops, and the entablatures were colored in the usual manner. (Triglyphs blue, mutules blue, metopes red). On the northern building the drops are entirely wanting on the mutules, while they have an elongated form on the regulas, are made of marly limestone and are inserted; only 5 drops were suspended.

In the central structure, in which the Agonistes and their followers, as well as the Hellanodices, had to take the oath prescribed for them, indeed stood the Statue of "Zeus Horcheios", and this space was therefore uncovered.

The apsidal rooms are explained as treasuries, in which were kept the state funds, which were needed for the anministration of the place and the festival. [1]

Note 1. See Ausgrabungen. Vol. 40. Pls. 35, 36; Vol. 5, p. 32.

More light on the peculiarities of these public buildings is obtained by the discoveries in Priene and Miletus, as well as by the publication of the so-called Thersilion (thus named after the founder) in Megalopolis. The latter was a rectangular assembly hall 200 * 171 ft. with stepped seats, and it stood in the immediate vicinity of the Theatre. (Fig. 454).

The places of the visitors rose in the form of an amphitheatre; those nearest the external walls were therefore only 8.2 ft. higher than those nearest the speaker.

Two smaller and similar assembly halls are still attested

in Eleusis and Lusoi.

Relatively well preserved and entirely distinct lies before us the Buleuterion at Priene, with its nearly square ground plan of 65.6 × 69.0 ft. -- a buildingfrom the 2 nd and 3 rd centuries B.C. The interior was lighted through doorways and windows in the outer walls; the ceiling and roof were supported by the walls and piers. The stone seats and the access to them are still preserved entirely. (Figs. 457 and page 223 in the Priene Work). Its arrangement is allied to that of a theatre; in the middle is a square area with an altar, from which the marble seats rise on three sides, ending with oblique walls next the fourth side. The rear wall exhibits a rectangular niche on the right and left of which is a doorway. The span of the ceiling is 47.7 ft., measured between the posts, this being reduced to 35.0 ft. by later repairs. The conjecture is expressed, that the building served for both the "boule" and the "ecclesia".

Of greater value on account of its architectural design and treatment is the Buleuterion at Miletus, consisting of a proppyleion adorned by columns, a court surrounded on three sides by columns, at the centre of which rose a richly treated tomb of a hero.(Fig. 458). Four doorways led from the court and p portico into the council hall, whose seats rose in semicircular form, its ceiling and roof being borne by strong external walls and by four isolated supports (columns), that were 44.3 ft. f from centre to centre, thus similarly distant as in the like building in Priene. [1] (See ground plan according to the Publication of the Royal Museum in Berlin; Milet, Ergebnisse der Ausgrabungen und Untersuchungen seit dem Jahre 1891. Das Rathaus von Milet, von Hubert Knackfuss. Berlin. 1908).

Note 1. The date of the building is referred to the years between 175 and 164 B.C., and it also noted, that Epiphanes had the Council Hall in Antiochia built on the same plan as that in Miletus -- or the reverse.

Fig. 6 in the Work gives a fine representation of the present condition of the interior, according to which the marble seats are still well preserved and are in place. The corresponding propyleion has columns and antes of the Corinthian or-

order of doubtful beauty. The half columns of the hall exhibit Roman Doric capitals with carved egg-and-dart mouldings on the echinus, the shafts are fluted, the endings of the triglyphs show a late form, the exteriors of the walls are ornamented by flat round bossy shields carved on the stones, and in t the interior by pilasters. Instead of half round columns, bold square piers occur at the external angles.

The four columns supporting the ceiling and roof were of the Ionic order, the roof being a gable roof with plain pediments. Above the triglyphs were dentils, the cyma being ornamented by sculptured palm leaves, scrolls and lions' heads.

The foundations of a building in Delphi, termed a buleuterion, enclose the ground area of a rectangular interior 16.4 × 39.4 ft. or 645.86 sq. ft. The entrance is assumed at one end. Therefore this Council Hall was but half as large as the Conversation Hall of the Cnidians in Delphi, and it would afford space for about 70 seats.

Pausanias takes pleasure in mentioning them in this or that place (Elis, Sparta, Athens etc.). He relates that the Council Hall in Sparta stood beside other magistracy buildings on the Market-place, and that the Gerusia or council of the elders met therein, while he only states in the description of Athens, that near the Council Hall of the five hundred (citizens chosen by lot, of which for 35 or 36 days, 50 men had charge of p public affairs and composed the preliminary court of the public assembly) was the so-called round building, in which the Prytanes offered sacrifice. Concerning the Council Hall in Elis, the passages relating thereto have been given in connection with the gymnasion, and in those concerning that in Megalopolis, with the Market-place.

Pausanias states concerning the Prytaneion, that it was placed within the Altis in Olympia, that an altar of Artemis stood before its doorway, with a hearth in its internal apartment, on which a fire always burned both day and night.

The Prytaneion in Olympia appears in the excavations as a s spacious rectangular structure, much subdivided by masonry of different periods.

The Prytaneion was originally in each Grecian city the House of the Prytanes, the chief officials, in which was the Sanctu-

Sanctuary of Hestia, the sacred hearth of the state. From thence, the colonists carried with them the sacred fire to the new settlements as a symbol of continual union. In Athens, n north of the Acropolis, was for a time the seat of government, the laws of Solon were written in it, and statues of Eirene (goddess of peace) were placed therein. (Pausanias, I, 18).

Here likewise occurred the public meals of the Prytanes and the distinguished citizens during their lives, in which envoys and guests of the state also participated.

The Propyleion in Priene, whose ground plan is reproduced in Fig. 459 after that represented on page 223 of the Priene Work, consisted of a paved square court with sides of 23.0 ft. with a portico around this, adjoining it being two elongated , three larger and three smaller rooms. The form and size of the area 57.5 × 78.8 ft. correspond to all medium sized houses in Priene.

Public buildings for the object of pleasant society, where neither food nor drink was supplied (like those still in the South, for example in Sicily, but only in the form of large rooms) were usual, and these were the Lesches or Conversation Halls. We may conceive them as having been built like courts or porticos, rich in architectural interiors, since the greatest artists did not disdain to adorn their interiors by paintings, like Polygnotos in Delphi. Pausanias devotes seven sections of his tenth Book to the description of these paintings, evidence of the importance and prominence in which he held them. Concerning the building, he merely says, that it was founded by the Cnidians and was named "Lesche" by the Delphians, since men assembled there in old times to entertain themselves with grave matters as well as with common affairs. The excavations of the French at Delphi have also brought to light "the slight remains" of this structure. It was of rectangular plan, 26.2 × 52.5 ft., and it appears to have been externally with the simplest architectural treatment. Plain walls with an entrance doorway in the side, with covered porticos inside before the foun walls decorated by paintings, and which surrounded a little court 36.1 × 13.1 ft.= 473.63 sq. ft., that was indeed furnished with ornamental shrubs, flowers, and probably with a fountain of water for drinking. A quiet little resting place.

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But whoever wishes to recognize in the little court or flower garden a "place for athletes to exercise", may drop this. Slight traces of painted stucco plastering still remain, as well as four plinths for wooden posts.

That there were many such places of assembly in Greece is to be seen in Homer, where Melanthe scolds Odysseus:--

"That not to sleep, thou goest into the smoky dwelling of the smith,

Or to the public house and there pratest of many things".

Such a Lesche in Sparta was called "gaily colored" on account of the paintings, the same appellation as that for the painted Stoas.

DIVISION XIII. CITIZENS' DWELLINGS, ROYAL PALACES AND LIBRARIES; CITIZENS' DWELLINGS OF THE HISTORICAL PERIOD.

Just as architecture developed harmoniously and nobly during the best period in temples and state buildings, so did it take little part in the development and extension of the House in the city. The less interest was devoted to the latter, since the entire thought and customs of the rich and free citizens culminated in the most complete participation in public life. Political activity occupied all men, and thus no especial worth was attached to the home; it had merely to satisfy the needs of a household; most men only spent time in their own houses for eating and sleeping.

While the dwelling of the prosperous, of the political leader and of the ruler of the people was simple, and in most cases the democratic spirit permitted no prominence of the individual in this respect, the home of the artisan and of the poor was reduced to a very small measure of architectural treatment. The streets were small and dirty, and men might even be run over by herds of swine in the side alleys of Athens,or these might be utilized after the manner of Blepyros in Aristophanes, and they were so narrow, that Hipparchos had to lay a tax on the overhanging stories and the doors, that opened outward toward the street; thus the houses standing on them i indeed also corresponded to these conditions.

On the western, southwestern and southern slopes of the Acropolis of Athens, numerous ruins of Cyclopean foundations, some being of important dimensions (88.6 and 59.1 ft.), mark the places where formerly houses stood, perhaps also public buildings and sanctuaries, intermingled with remains of Cyclopean terrace walls. The houses were certainly treated simply and without ornament, set on strong stone foundations, built of bricks, burned or merely sundried, as today is the case in the Argolic plains. Plans and the subdivision of private houses are unfortunately lost to us; they must have been simple enough indeed, since about 514 B.C. even the city of Athens is described as crowded, dirty and uncomely. The houses of a Themistocles and a Miltiades were small and modest -- but the deficiencies must have been greater 800 years earlier.

We likewise know of other cities, that they were not built compactly; thus Sparta consisted of five open villages, "not distinguished by temples and costly designs, but composed of separate villages according to the Hellenic mode of building cities".(Thucydides). The houses were rudely framed; according to the laws of Lycurgus (880 B.C.), for the construction of ceilings and doors were to be employed no tools other than the axe and the saw. Two kings, Leotychides and Agesilaos, indeed not without scorn, when as foreign guests in a house, they observed its carefully carved woodwork, asked the question, whether trees grew square there.

The excavation of a small portion of the new city near the Dipylon in Athens shows us a group of small and very poor houses, placed without order and without reference to the course of a street, built of ordinary stones with earth or mortar.. Less thrown together stood the houses on the rock of Areopagus, whose plans may still be seen by the levels cut in the rock (Fig. 460). Neither these nor the later excavations in Megara permit a characteristic or typical form of ground plan to be recognized. [1]

Note 1. Compare Ephemeris Arch. p. 22-56; pls. 4, 5, 6. Athens. 1890.

Likewise the plans of the "two houses" uncovered in Piraeus beneath the quarter of the city on the east side of the Akte, which Fig. 461 represents, admit of finding no fixed scheme of the plan of a house. The principal facade is on the western side, where a longer street leads, which is intersected by two parallel streets, whose width is 18.04 ft. The walls are chiefly built with two faces and are filled with spalls,[2] and they were externally plastered, the last coat being uniformly colored, sometimes red and veined. Thresholds do not exist or remain. The floor consists only of tamped earth with small p pebbles inlaid, which frequently form patterns. [3] In the northern house, a narrow passage leads directly into the court, around which are grouped the rooms. The cippus shown seems to have supported a small sanctuary, and a small garden may have been placed on the terrace. [4]

Note 2. On the use of wooden courses in a wall, see notice by Dumont in Reva Arch. 1867. II. p. 227.

Note 3. On plans of houses, see Koldewey, R. Neandria etc. Berlin. 1891.

Note 4. See maps of Attica, edited by E. curtius and J. A. Kaupert. Explanatory text. Heft 1, p. 56. Fig. 7 (from a Milchhöfer). Berlin. 1881.

Concerning the peculiar plan of the house about 400 B.C., a passage of Xenophon's Oikonomikos (Art of Housekeeping) affords some data; "(The house) is not adorned with decorations of all sorts (poikilemata, paintings, embroideries, carvings etc.); But the rooms are built with forethought, so that they may be apartments most suitable for what is to be in them, and that they may themselves invite propriety. The sleeping room in particular, placed with due retirement, requires the most costly ornaments and furniture, the dry rooms fo the house for the grain, the cold rooms for wine, the open ones for all those labors and furniture needing light. The rooms for the men are to be so arranged as to afford coolness in summer, but to be warm in winter. In the general design of the house, to see that its open side be toward the south, whereby in winter it will enjoy the sun, in summer the shade. (Since according to Socrates, Memorabilia, III, 8, 9, in houses turned toward the south, the sun shines into the porticos, while in summer it p passes over the projecting roof). The women's apartment to be separated from the men's apartment by door and bolt, so that nothing may be taken out of the interior, unless authorized".[1] The architect cannot obtain much from this material!

Note 1. See Xenophon's Oikonomikos, translated by F. Zeising. Chap. IX. p. 48-49. Stuttgart. 1866.

The evil conditions described for the entrance gave place to better in time, and according to Aristotle's Essay on the Commonwealth of Athens, [2] there were as a result five police masters in the city of Athens to take care, that the scavenger contractors should not deposit garbage within a distance of 10 (?) stadia from the city wall, that none should build on the streets, or project high buildings over the street line, or carry high water-spouts toward the street, or should have the leaves of the door of his house open toward the street.

Note 2. Translated into German by G. Kaibel and A. Kiessling; 2 nd edit. p. 83. Strasburg. 1891. (The distance from the city

wall is indeed incorrectly assumed.

The excavations on Delos in July and August, 1883, led to t the discovery of the plan of a house of the period of the 2 nd century B.C., which Pierre Paris [3] published, and which we reproduce in Fig. 462. The house had a single exit to the street and also no vestiges of windows; for the latter always form the exception and not the rule. The rooms obtained light through the doorways from the court, whose pavement was laid in mosaic of pieces of blue and white marble, and it contained a cistern. Paris is inclined to assume the house to have been in two stories, and he extends the peristyle into the upper story, induced to do this by the great mass of ruins of the building. [1]

Note 3. In Bull. de corr. Hell. 1884. p. 473-496.Pl.21.

Note 1. Concerning a house on Delos, also see Greece, a handbook for travelers by K. Baedeker. Leipzig. 1888. p.147-148. (later edition in English).

Ross [2] expresses himself very clearly in respect to the house on Delos as follows:-- "Still worse, since more easily destroyed, is it with the private houses, of which an entire quarter of the city would still be standing, were it not for such barbarism. Their walls now usually remain for a height of two or three "shoes" (i.e. 1.97 to 2.94 ft.); the upper portion is broken; the best stones, and especially the angle stones have been removed, and the others with the loose material form great heaps of rubbish, that cover the ruins. Beneath this rubbish are indeed concealed many mosaic floors, and a complete plan might still be made of many ancient houses. -- The material of these dwellings is small stones of the local slate and granite, joined with mortar, the walls are internally lined with pieces of marble (stucco marble ?), almost as hard as stone, on which may be recognized occasional vestiges of color. In many houses are found and partly still erect, granite columns of one to two "shoes" diameter, which have escaped the rage for destruction by their greater hardness, or by the insignificance of their material. They chiefly stand in squares of eight or twelve, and apparently formed portocos surrounding the inner courts of the houses. -- Beneath many houses, and perhaps under most, were arranged cisterns, partly

covered by narrow arches, partly covered merely by long granite slabs, on which rested the pavement".

Note 2. In Ross, L. Reisen auf den Griechischen Inseln des Aegäischen Meeres. Vol. I. p. 30 et seq. Appendix to third letter:-- Reisen und Alterthümer auf Delos und Rhenäa. Stuttgart and Tubingen. 1840.

The plan from Delos exhibits a richer architectural design of a Grecian private house, and such or a similar one was the basis indeed of the complaint of Demosthenes, that the private dwellings had become so large and the public buildings so small, while the reverse was formerly true.

The contrast between the modest ancient and the later pretentious architectural styles was afterwards emphasized by Hadrian also, by his inscription on the arched gateway near the Olympeion in Athens built by him, where with a certain self-consciousness, he contrasted the new city with the homely ancient one.

The central point of the later house was found in the court, on which the rooms opened, receiving from it light and air.

Vitruvius places (VI, 7) in these or in the Grecian house near the entrance doorway a passage of moderate width, on one side of which lay the stable for the horses, and on the other were the rooms for the doorkeeper, and which could be closed by a second doorway at the end. This space between the two d doorways was termed dyroreion. Then followed the entrance to the court, with colonnades on three sides; on the side toward the south, the wall opened between two antes set far apart, and this room, the prostas or parastas, was made about one-third less in depth than width.

Thence inward were arranged large halls in which the housewife sat with the wool-spinners. On the right and left of the prostadion were placed the sleeping rooms, one of which was c called the thalamos, the other being the amphithalamos. But on both sides of the porticos were arranged the dining room, sleeping rooms and the servants' rooms. This portion of the building was then termed the women's dwelling.(Gynaikonitis). With this was then connected a spacious dwelling with wide columnar courts, whose four colonnades were either of equal height, or that toward the south had higher columns. Suca a court with three porticos of equal height and a higher one was termed

"Rhodian". Next the portico toward the north lay rooms for eating and for paintings, or that next the east being the library, that next the west being a conversation room, but a square hall next the south, which should be so large, that four dining tables could be set therein, still leaving space for service and for plays. The men's banquets were held there; therefore this portion was called the men's dwelling (andronitis). On the right and left of it were placed small dwellings with moderate dining and sleeping rooms for guests, so that these found lodgings in separate apartments and not in the columnar courts. The two columnar courts were connected at the middle by passages.(Metaulos and mesaulos).

Vitruvius also places the andronitis in the rear and the gynaikonitis in the front peristyle, opposed to the other tradition. A defective text indeed occurs here; that any time existed is improbable, when the two principal parts of the house interchanged places, and it is not to be harmonized with what is elsewhere stated in regard to the place of the women in the house.

Becker's conjectural plan in Fig. 464 therefore corrects the errors of Vitruvius, and which according to Winkler might have originally been improved.

The great house must here be satisfied with a single entrance doorway, as in Pompeii; no portal adorned with columns gave admission, as erroneously assumed for a house on Delos. [1]

Note 1. See Paris in Bull. de Corr. Hell. 1884, p. 474; also Tarbell, F. B. The House at Delos. The Classical Review. Vol. 5, no. 3; March 1891. p. 130, 131.

Hence if the exterior of the house appears simple and plain, on the contrary the interior was arranged with much skill and great picturesque effect; an agreeable luxury developed , and architecture again produced splendid and original things.

The courts with their porticos adorned by columns, richly decorated walls of the entrance, the surfaces of the walls of the reception and living rooms, covered with white stucco finish and painting, the panels of the ceiling with their carving (Vitruvius, VI, 7), the doorways hung with heavy stuffs, and the floors covered by rich carpets, the elegant furniture,

flowers, and netted articles, the sparkling water splashing in the bright sunshine, the deep blue sky over the open courts, the magnificent effects of lighting, the light and shade, the attractive views and beautiful prespectives from all points, all harmonize to heighten the conception of a splendid and yet comfortable dwelling.

No hollow magnificence of facade with plain interior, as so common today in the German empire, those architectural falsities, overloaded with columns and caryatids, those barracks f for rental externally representing palaces, are found on Grecian soil, not even in the late period; men built not for show-loving street passers but for themselves, their families and their guests. Hence the charm belonging to the antique house may never be stripped off, and for this reason its chief points and attractions will recur more and more in the house architecture of all civilized races, and will outlast us.

To avoid repetition, a thorough treatment of the late Grecian house is here omitted, such as is usually attempted on the basis of the well preserved and related Pompeian house.

The ancient Grecian family dwelling was not directly connected with the street, like the low rented house, a separate type of which did not exist, and which could scarcely have had any claim on architectural criticism, just as little as the great multitude of the ordinary shelter buildings of our own time.

Concerning the construction and arrangement of the house, relatively but little direct information can be given with certainty. Neither the existing structural remains nor the i ancient writers afford satisfactory data in this respect.

Cellars beneath the family dwellings are everywhere proved. If the house were built on a rocky site, excavations in the rock frequently occurred instead of cellars (like such in the vicinity of modern Athens and of the Piraeus, also to be frequently found in Sicily) for storing provisions.

The external walls of sundried bricks or natural stone received internally and externally a coating, which usually consisted of ordinary lime plaster, the increasing magnificence of the late period alone commenced to decorate the walls both

inside and outside with paintings. Of the otherwise plain and simple house of Phocion (Plutarch, 18) it is said, that it was adorned by bronze plates (sheets); we should imagine this decoration of the house of the general to be perhaps like that on the Council hall in Elis, where bronze shields were suspended "for ornament". (See Pausanias). A simple Lycian house, built against the rock and whose walls were constructed of polygonal masonry is represented in Fig. 465.

The doorways (principal entrance doors) were closed by leaves of woodwork, that might be covered by bronze plates; they turned on pivots, whose sockets or marks still appear on many thresholds and lintels. The fastening was by an inner transverse bar placed by the porter and raised or even lowered from the exterior by a kind of key. The doorways in the interior were frequently hung with fabrics, as still usual in the south.

Windows are proved by representations on vase paintings and other works of antique art, where women looking out of the windows occasionally occur; hence they were not uncommon, but were chiefly arranged in the upper stories alone, as in the houses for rental. They were closed by wooden shutters or by fabrics.(Fig. 466).

The ceilings of the rooms were plainly made with wooden beams or were decorated by carving, color and paneling. The roofs (simple gable roofs) were constructed of hewn timbers and covered by clay-and-straw, curved or flat tiles.

A useful attic room could scarcely be found on account of t the slight inclination of the roof surfaces, in many cases, the framework of the roof alone formed the ceiling of the upper story.

Chimneys (smoke flues) were only in kitchens; the rooms were warmed in cool weather by charcoal braziers or by portable stoves (andrachia, pyraunoi, chaminoi) as still the case in the South. [1]

Note 1. See Jahrb. d. Kais. Deutschen Arch. Inst. Vol. 5. p. 118. Berlin. 1890.

Privies in the house must have become common only later. In Pausanias they were determined in Cnossos already in the second thousand years B.C. Quotations from Aristophanes, Demosthenes and others for their early occurrence are uncertain; the earl

earliest is to be esteemed a passage of Eubulos (4 th century B.C.) in Athenaeus (p. 417), where it is said, that the Thebans at least had places, that were near and arranged conveniently for certain purposes. The trustworthy Herodotus tells us of his time (Book II, 35):-- "Thus nearly all customs and uses of the Egyptians are opposed to those of other men; -- they satisfy the demands of nature in the houses; but they take their food in the streets and say concerning this, that one shoul do in privacy, what may be unseemly though necessary, but in public, what may not be unsightly.

The floor is to be understood as being of stone, mosaic or slabs, covered by skins or rugs during the cooler season of the year.

Although we must conceive the dwelling of the best period as being simple and plain in its exterior and construction, yet its furnishing and utensils must be imagined as progressively treated with the refined sense of beauty, "which has been called the inheritance of the entire Grecian race".

On vase paintings of the entire early period, we find artistically perfected and treated furniture; tables, chairs and beds. Tables are only used at meals; work tables in our sense did not exist; for example, writing was done on the knee. Wa Wardrobes were not usual in housekeeping; in chests or portable boxes were placed articles and clothing materials, and in small caskets were ornaments of gold and silver, ivory and precious stones. Many things were also kept in great vessels of clay.

Vessels were made of wood, of burned clay and of metal; in their treatment and execution appeared the extraordinary artistic gifts of their makers in a high degree, as shown by the many remaining cups, shallow drinking goblets, lamps, candelabra, mixing vases, unguent vases, and the metal mirrors of such great artistic importance.

Hotels in the modern sense were unknown to classic antiquity. The enjoyments of the table and the communion in the cups were limited to the circle of friends in the house.

Public inns were mentioned in trading places and harbors, in festival and pilgrimage localities, and where the selling of wine is mentioned, these and their visitors enjoy no good repute. Very little information concerning their arrangement

has become known.

The Leonidaion in Olympia may be regarded as a house arranged on a better footing.[1] The building was of rectangular plan (241.08 × 263.06 ft.), in which halls and rooms were grouped around a court 98.4 ft. square. The coutt was itself decorated by flower beds and water basins, these indeed being of the Roman period; the columns in the interiors were of the Doric order, while on the exterior, Ionic colonnades surrounded the building, that in the most magnificent way must have fulfilled its purpose as a hotel for guests of honor of the State of Elis, for friendly princes and statesmen.

Note 1. See Ausgrabungen. Vol. IV. p. 49, pl. 38; V. p. 8, 43, pls. 6, 41.

On the soil of Asia Minor,. by the labors of G. Niemann and E. Petersen, has been made known to us a greater dwelling, the House of Kleistos at Termessos in Pisidia, whose ground plan is given in Fig. 467. Its partly preserved walls are constructed of smooth ashlars 1.97 ft. thick in alternately high a and low courses. Windows and doorways still remain. The main entrance doorway exhibits next the street Doric antes, above which are architrave, triglyph frieze and cornice, whose cyma is beset by lions' heads. The opening has a clear height of 14.6 ft. The arrangements for closing the doors and windows still remain. They consist of wooden doors in two leaves and wooden shutters. [1]

Note 1. See Stadte Pamphyliens und Pisidiens, with the collaboration of G. Niemann and E. Petersen, edited by Count Carl Lanckaronsky. Vol. 2. p. 101. Vienna. 1892.

By the excavations at Priene, we have not only recovered the entire plan of the city, but even the ground plans of the separate houses are disclosed to us. They exhibit no compositions on axes, like those of the houses on Delos or at Pompeii; men do not wish to show to a person entering a consistent architectural view of the dwelling, but rather the opposite.

A long and narrow passage at the side leads into the interior, from which one passes into the court and the living rooms, as shown by Fig. 468 of the plan of house No. 33 in its original design. (See the German Publication on Priene. p. 285).

The authors of the splendid work do not exclude the two-story design of the house, and they place the stairway to the attic or upperstory in the room 7.7 ft. wide beside the rooms designated as prostas and oecus. They also indicate stairway arrangements not at hand in the question of providing the women's rooms, when they lament the absence of the upper stories in place. They find necessity in domestic architecture, when hip and gable roofs are assumed and in which naturally result useful rooms above the ceiling beams, that these must be made accessible. But they could not be omitted for terrace roofs, as these were also to be made accessible and usable.

There remains as characteristic for the designated typical plan No. 33, the sunny and open uncovered court, not surrounded by porticos, with an exedra opening into it and adjoining side rooms, opposite to which is a prostas, that is characterized by an external architecture like an ante temple, behind which is found a cool and sady oecus. Between exedra and oecus are inserted some living and housekeeping rooms. The rectangular court ends on the fourth side of the extended house entrance with a hip roof borne by slender supports. From this scheme are developed the ground plans of most houses, that likewise here as in Pompeii do not consist entirely in details! but are frequently to be regarded as variations on the same ground theme.

In the sketch of the restoration given by Th. Wiegand (p. 286) is no two-story construction of the house, but instead of it a development of the roofs of a one-story design, that is not probable. The prostas and oecus are emphasized as ante temple architecture with triglyph frieze and gable roof, as being architecturally complete and entirely detached forms, adjoined by the other parts of the building with low shed roofs, thus producing esthetic and technical imperfect works, that are foreign to the antique. Fig. 469 exhibits the roofs chosen, where the solution at the left corner did not pass without question. An arrangement of the roofs as given on Pompeian houses would have been more acceptable (Fig. 470), even if the covered connecting passage to the rear part of the house were only carried at the ground level. The prostas and oecus might be elevated

and have an imposing effect, without making them a temple or the facade of the house of a son of Anak.

I presume that there were also in Priene storms and winter rains. Protection against them would not be afforded by the given successive arrangement of the rooms without connecting doorways. To reach the exedra or the rooms next it, one must pass across the court without protection in bad weather. From the street rains through the covered entrance to the house, across the wet court into the rooms and to pass again from one to the other, one must again cross the court! Must the inhabitants of Priene with the so-called "sunny court system" have actually and entirely forgotten the system of protection against wind and weather?

As in all periods and among all peoples, men certainly paid attention to the points of the compass, so far as possible, in the location of the rooms according to their purposes.

I have often enough observed in the open air in Sicily and other southern countries, how the peasant women and children constantly shifted their places for working and playing before the house according to the position of the sun. They sought in summer the shade, in winter the sun; they remained in the morning before the western side of the house, in the evening before the eastern.

In technically notable things, Th. Wiegand states that he has established three species of Hellenistic house walls.

1. Split stone walls with isodomic ashlar facades.
2. Ordinary split stone walls.
3. Airdried brick walls.

For mortar was only employed clay, and only the local and nearest sorts of marble were considered. The external surfaces of the ashlars had bosses, the heights of the ashlars were from 0.98 to 1.74 ft., their lengths being from 1.74 or 1.97 to 3.28 ft. The connecting cramps, that came into use only exceptionally, had the U-form. The thickness of the walls is usually 2.3 ft., which were of split stones coated with stucco. Walls of split stone below and of airdried bricks above have been found, a kind of layers required by the nature of the material. In the oecus the height of the rooms is given as up to 19.7 ft.,

which in view of their dimensions in length and breadth (23.0 × 23.0 and 12.1 × 16.4 ft.) may be designated as not affording beautiful proportions of the interior. The wall decoration in the interior exhibits the so-called incrustation style with brightly colored ashlar courses, as floor covering served the simplest limewash, more rarely mosaics, and there only the most primitive execution. Windows no longer remain, which permits the inference of a high position for them, as in the houses on Delos. As closures frequently served perforated terra cotta plates 1.7 ft. wide and 2.3 ft. high. The door leaves swung inward, as shown by the door rebates on the sills. The roof was that common from ancient times and covered by flat a and concave tiles.

All Hellenistic roof tiles exhibit the traces of a reddish brown coating, similar to the terra sigillata, but without its peculiar matted glaze.

The citizens' dwellings were in extent and splendor of equipment equalled by the residences of the nobles, the palaces of the kings, besides the royal villa, to be mentioned with its parks and game preserves, fish ponds, state gardens, waterworks etc. Little of these has been preserved. The remains of an older and of a later one in simple forms are to be found on t the acropolis of Pergamon, that indeed date from the time of Eumenes II. Around a court surroungedby porticos are grouped the halls and larger apartments, south of which are the service buildings.(Fig. 471).

But contrasted with this small design are even larger ones as in Alexandria, Antiochia and Syracuse.

The Royal Palace in Alexandria occupied a third of the Grecian city. Concerning that in Syracuse, A- Holm states in his Geschichte Siziliens (Vol. III, pa 173. Leipzig. 1898), that it later served Verres as an official dwelling, in which he had arranged for months a goldsmith's shop, to prepare for his own purposes the confiscated vessels of the noble metals.

Beside the palaces must still be mentioned the buildings for arts and sciences, which stood in relation to those, among which the Library in Pergamon may be referred to, north of the court of the Temple of Athena. The traces of the bookcases a

are still preserved. Figs. 472 a, b give the ground plan and the section after the drawings of R. Bohm. Still more tangible materials have been supplied to us by the K. K. Austrian discoveries in Ephesus, in the Library of Celsius, which was built in honor of this ruler by his sons about 100 A.D. It shows a rectangular hall for the books with an exedra and recesses in the walls for presses, a portico in front with a flight of continuous steps, something over 65.6 ft. in length.

The hall was surrounded by galleries on three sides. Outside it extended wide canals on the rear and ends to prevent d dampness. The entrance facade in two stories adorned by coupled columns had a stately effect. (Figs. 473, 474; ground plan and exterior after the beautiful drawings of Wilhelm Wilberg in Jahrb. d. Oest. Arch. Inst. Vol. XI. 1908.

DIVISION XIV. TOMBS AND MONUMENTAL TOMBS.

To bury the dead decently and carefully was a sacred duty in Greece; the relatives took great care that this should be done; it was strictly held, that even at least a handful of earth should be scattered over the corpse of a stranger.

The prevailing form of burial of the dead was by interment, both in the mother country and in the colonies. Although cremation was likewise common from an early time, it does not appear to have been uniform in all periods and was not everywhere usual.

To bury the dead in their own dwellings, in court or garden, was permissible according to the ground plans of the oldest Athenian houses resting on the rock terraces.(Fig. 460). The burial of the dead before the gates of the city in separate places or preferably along the public ways was common; Burial within the city, where it did not continue as a custom (as for example in Tarentum) was regarded as a special privilege or distinction.

Special indications characterized the burial places. As widely visible mounds of earth, often surrounded by circles of stones and with a memorial on the apex, were they shaped in t the heroic period, as for example, the grave of the Athenians, who fell in the battle of Marathon, was marked by a mound of earth.

In the midst of the plain of Marathon, a single conical hill, almost bare and with a few bushes, rises about 29.5 ft. high above the level land. This hill is now known as "Soros", and it is held to be the burial place of the 192 Athenians, who fell in the battle near Marathon, and it has furnished the chief grounds for locating the battle-field. But the accuracy of this assumption might be doubted, since the excavations undertaken at this place were without result. At the beginning of the last century the hill was thoroughly examined, and Schliemann also set the spades at work here some years since. A systematic investigation of the hill was recently begun, and this third investigation led to the desired success. In the hill of about 164 ft. diameter was cut a trench 19.7 ft. wide and 85.3 ft. long, which laid bare about one-twelfth of the en-

entire area of the base of the hill. But while the earlier excavation was not carried sufficiently deep, this was sunk 9.9 ft. below the level of the surrounding plain. So much is the elevation of the ground, resulting in the course of centuries. At this depth below the present surface was found the original surface. Here was a layer of ashes extending over the entire area of the grave, strewn with burned bones and the remains of burial vases. This find makes it undoubted, that the burial of a great number occurred here, just as might have been only after a battle. Moreover since the burial vases provided for the dead entirely suit in their style the period preceding the battle of Marathon, it is no longer to be doubted, that we indeed have here the grave of the 192 Athenians slain near Marathon. The layer of ashes extending over the site of the tumulus is so thick, that one may assume that a great funeral pyre was built on this place, on which were burned the corpses of the fallen. In this layer of ashes are still found brands not completely consumed by fire, but that still permit the recognition of the structure of the wood. The bones found are much injured and show the marks of burning; a great part of the vases are also burnt. Further destruction was then caused by dampness. The pressure of the earthen mound, heaped about 39.4 ft. high above the burial place, may have contributed to the fact, that scarcely a single one of the vases found has remained uninjured. About thity vases of lecthyos form have been found up to this time, which are decorated by black figures hastily painted. If no particular marks of art are among them, this material is still of great value for the study of vases, since a fixed later point is here given for the date. A traditional monument has become a historical one by this discovery, and recalls to the present race the most heroic era of the war of ancient Greeks for freedom. [1]

Note 1. From Allg. Zeit. 1890. Also Arch. Deltion. 1890. O tumbos ton Marathonomacheon (Pln. D). p. 123-132.

Sepulchres also rise in form of pyramids (Cenchrea) from the ground; they are scattered over all Greece to Asia as columns and steles. With increasing luxury, the latter received rich figure sculptures; from this basal motive came later the broad heroons enclosed by columns and crowned by pediments.

They likewise rise as great isolated monuments, cut from the solid rock, as a high square pillar on a pedestal, or as in L Lycia, cut as a sarcophagus, laso as imitations of dwellings, imitations of detached structures (Figs. 475 to 480), in the forms of chapels or temples. Wealthy houses or families had formal sepulchres built or cut in the rock, and they secured for themselves and theirs their own places in family tombs.

Luxury in these matters appears to have risen to a high point. For example, Demetrios Phalerus had to issue a decree to limit them, and accordingly in Attica a sepulchral stele could not rise more than 3 ells above the burial mound. (See examples in the Ceramicos in Athens). -- Fig. 479.

The bodies of the poorer classes were buried in the common burial place of their community; sepulchral columns perpetuated their names even there.

If the body of the deceased could not be obtained, then an empty grave in imitation of the actual one was prepared as a memorial. For the missing one, an empty cushioned bier was borne at the burial.

The corpse was placed in the clay coffin (cherameos soros), which was constructed of terra cotta in the form of a roof, and the use of which among the Athenians was regarded as a custom of their fatherland (Fig. 481). Besides the coffin of flat tiles, there were also others of curved plates .[1] Also clay chests for the dead (Fig. 482) and wooden coffins were in use. "If then the bones are carried away, then come carts with coffins of cypress wood, one for each community, and the bones of each one are in the coffin of his community", writes Thucydides.(II, 34).

But with the Greeks the clay coffin also takes the form of the rectangulah house with gable roof and gables, as the last dwelling of the departed. The desire to decorate it led to painting the smooth clay surface. (Fig. 482 [2]). The earliest Grecian coffins in the form of the sarcophagus , later common, are the beautiful Klazomenian examples from the 6 th century, whose form is indeed not original in Greece, but was introduced. (Fig. 483).

Note 1. See Stackelberg, O. M. V. Die Gräber der Hellenen in Bildwerken und Vasengemälden. Berlin. 1838.

Note 2. Reproduced from Antike Denkmäler, pub. by Kais. Deutschen Arch. Inst. Vol. 1. Pl. 44. Berlin. 1891.

Marble sarcophaguses relief ornament seem to first occur in Greece about the end of the 4 th century B.C. One of the oldest and most beautiful style is a sarcophagus with the combat of the Amazons now in Vienna. This is even excelled by the so-called sarcophaguses of the Macedonian kings of the Hellenic period found in Sidon. The latter were discovered in a common sepulchre (Fig. 484), placed in a separate chamber cut in the rock. Some of them have the highest art value. Of really thrilling beauty, of high dignity with wonderful invention and execution, in a sarcophagus with sorrowing women, that otherwise bears no marks of painting.(Fig. 485). Its angles are emphasized by by Ionic antes, between which are on the longer sides five, and on the ends two Ionic half columns of the most careful execution. In spite of the relatively small scale, no bead, no acanthus leaf, no volute band and no flute is forgotten, all being so skilfully, easily and limpidly wrought, with such noble and elegant proportions of the columns, that nothing appears little or labored. Between the columns are smooth enclosures extending to about one-third the height of the columns, before which are placed (2 × 6 + 2 × 3 =) 18 female draped figures between the columns. No position or pose is repeated, and a special and interesting motive is found in each figure. With softly falling garments, bowed heads and f folded hands, a figure expresses the deepest emotions of sorrow and pain, like a precursor of the Mater Dolorosa of Renaissance art. One would almost believe himself standing before a work of the early Renaissance, so strongly, purely and seriously are the small figures conceived. On two other marble sarcophaguses, that exhibit no sculpture on the sides, the antique roof is imitated with wonderful accoracy. No ridge ornaments or acroterias are wanting there; the ridges bear palmations; the water spouts beneath the cyma are perforated; the lids are the most costly models of the Grecoan marble roof.On others are sculptured in the tympanum of the pediment a rider with prancing horse, or scrolls of leaves and flowers with round stems, scrolled and grooved, as on the cyma of the Leonidaon in Olympia, or on the Tholos in Epidauros. Everywhere

is the grace and beauty of Greek forms with high perfection in execution. The richest among the sarcophaguses belongs to the type, where the external surfaces are decorated by figure reliefs, battle or hunting scenes, as shown by the Amazon sarcophagus in Vienna already mentioned.

But what places the Sidonian especially high above all other known examples is their architectural treatment, which cannot be conceived more noble and characteristic. Its smooth plinth forms the base, above which extends a member, as on the walls of the Erechtheion, consisting of round, scotia between two f fillets, a smaller round, over this being an inverted Lesbian cyma with beaded astragal, fillet and apophyge. The mouldings are ornamented in the richest manner by interlacing heart-leaves and beads, and they form a magnificent base for the sides adorned by figures. The figures are 1.71 ft. high and are wrought in high relief, so that the feet and arms of some are entirely free from the background. The composition of the front side recalls in many ways the famous mosaic picture of the battle of Alexander in Naples. On the left of the spectator and on a tall horse, Alexander in flowing mantle and with leveled spear charges on the Persians, fallen into confusion, while on the right side a Macedonian general (Perdiccas ?),with helmet on his head and in flowing mantle, hastens into the combat with a less animated movement. Alexander wears the head covering to be seen on his coins and appears spirited and warlike, while the countenance of Perdiccas looks grave and gllomy-Wonderful is the movement of the design and wonderfully are t the details executed; pain, scorn, and longing for death are remarkable expressed in the faces; the bodies of the infantry, one of whom strikes a knife into the neck of a prostrate man, are finely modeled. The rearing horses have a truth and animation, which recall a master like Lionardo. The combat extends over one end in the same compact manner, the other side and e end are decorated by just as beautiful and animated hunting scenes with equally perfect execution. (Figs. 486, 487).

A cornice terminates the figure frieze, that consists of a heavier geison, whose front surface is ornamented by a skilfully wrought fret pattern, and of an echinus decorated and a pearl bead. These simple and noble architectural members, which

enclose the wild fluctuation of the battle and the hunt, contribute by their isolation and quiet no little to make the figure composition appear even more animated. On this substructure rests the massive lid, whose vertical members meet accurately at the crowning cornice of the sarcophagus and consist of a low architrave with ogee moulding and scotia, over these being a frieze decorated by vine scholls (grapes with vine leaves) and an Ionic geison with dentils. The latter are alternately ornamented by ram's horns and female heads with radiating hair. On the angles of the pediments are sculptured four liony lying down, while fighting figures adorn the pediments, which are indeed rather small in scale. On the front appears a distinguished man, thrown down by soldiers, who surround him.

If this work, executed in the noblest fine-grained white marble, is exceedingly entrancing, we are further enthralled by the colors, that cover the sculptures and are in great part still well preserved. Helmets and weapons of the warriors are partly gilded, the mantles of Alexander and Perdiccas are violet purple, the hair is light brown, the eyes and lips are painted in the most careful and remarkable way; the reins and bits of the horses, the arrows sticking in the flesh of the animals, were wrought in bronze, according to the marks and vestiges, and were then fixed in place; the vine scrolls of the frieze rise in gold on a ground of violet purple, the little figures of the pediments are not without color. On nude surfaces of figures, the bodies and faces, the marble is most carefully smoothed and it is further finished with a colorless wax polish. Thus the nude surfaces have the effect of a mild and no longer white brilliancy amid the gleam of the other colors, just as the human skin appears in reality. Therefore I could not subscribe to the statement of von Treu:-- [1] "I hold that a toning of the nude surfaces by mere wax is excluded;" aside from the fact, that I judge the soft or too strong rosy colored flesh tone, erroneously imputed to so many antique sculptures, to be not exactly a happy addition, and in consideration of the circumstance, that various artists have been able to treat their works differently in regard to polychromy, and much may have been a later addition. The colored figures

rise from a white ground and appear distinguished and not gay in their coloring. A good and likewise practical contrast to the colors of the figures is produced by the gold violet broad frieze band of the lid and by the light and shade effects of the richly sculptured base, which has the effect of a gray ornament painted on gray. [1]

Note 1. In Jahrb. d. Kais. Deutschen Arch. Inst. Vol. 4. p. 24. Berlin. 1889.

Note 1 a. See Durm, J. Die Makedonischen Königssarkophage. Cent. d. Bauw. 1890. p. 329; also Rev. Arch. N. S. Vols. 10, 11; further, Amer. Jour. Archaeol. 1887. p. 97; lastly, Die antiken Sarkophagen-Reliefs in Auftrag d. Kais. Deutschen Arch. Inst. mit Benutzung der Vorarbeiten von F. Matz, har. u. bearb. von C. Robert. Vol. II. Mythologische Cyclen. Berlin. 1890.

Simple stone sepulchres, not deep below the surface, where the dead were placed between stone slabs and dry limestone masonry were in use in Chilidromia. Tumulus and pit graves i in the heroic period and the placing of the corpses therein have already been treated.

With the corpse were deposited copper utensils, vessels, and small clay figures, favorite animals, articles of colthing, ornaments, and even food (Fig. 482). "Everyone brings to his dead a gift, if he desires". (Thucydides).

The tombs cut in the precipices of the valley of the Nile, with the vestibule and two columns between antes at the entrance, are recalled by the tomb facades of Asia Minor, cut in the rock, whose use depends on the natures of both countries, and which also suggest the grotto tombs in Rhodes, Cyprus, in Greece, on the north coast of Africa, in Nauplia and Syracuse, on Crete, Egina, Melos and Delos.

Concinuous rows of columns and piers before the sepulchral chambers, that are placed beside each other, and for which are utilized inclined rocky slopes, are found in Cyrene, and also vestibules adorned by columns and pediment, as in Asia Minor. (Fig. 480).

Peculiar monuments without any claim to artistic development are those originating in the 3 rd or 4 th century B.C., the hemispheres of blue marble, common on the island of Kasos,that

have a diameter of 0.83 ft. with the name of the deceased cut on their smooth front surface.

Of more artistic importance than these primitive memorials are the columns (chiones). The Grecian sepulchral memorial was developed to its greatest perfection in the Stele, i.e., a tall slab of stone set in the earth or fastened on a base, diminished upward and terminating with a cornice; above this it had an anthemion cap in simpler materials and only painted, or in richer ones consisting of sculptured luxuriant acanthus ornament with scrolls and palm leaves, which belongs with the most beautiful creations of Grecian decorative sculpture. [1].

Note 1. See the beautiful and comprehensive work: -- Die Attische Grabreliefs von A. Conze, published at the order of the Kais. Akad. d. Wissenschaften in Vienna. Vols. 1-3 et seq. Berlin. 1893-1900.

The front surface of the slab is usually further decorated by a magnificent seated figure in sunken relief with the memorial inscription beneath and two skilfully wrought rosettes above it. Figs. 488, 489).

After the 4 th century B.C., family scenes were preferred for the reliefs. Some of these represent the departure, the husband extending his hand to the wife and saying farewell, the father to his children, the wife to her husband and children; others are entirely without reference or purpose. [2]

Note 2. Others imply by extending the hand merely a token of good wishes and friendship.(See Comptes Rendus. 1861.).

A hydria beside such a figure, as frequently occurs on the reliefs of these sepulchral steles, signifies in accordance with the Attic custom, that the person buried there died unmarried. For these unmarried persons, the hydria alone was adopted as a memorial, earlier in clay, later being much larger and carved in marble; it might likewise be decorated by sculptures, the same scene of the departure, as shown by numerous examples. (Fig. 489).

As sacred places, we find the tombs also decorated by fillets and garlands; formal gardens were also arranged around them in the later period.

Heroa was the preferred name for the memorial stone shaped as a niche between antes or columns on right and left (aedicu-

(aedicula), between which were reliefs, and covered by an entablature and pediment. (Fig. 490).

Portrait statues, if permissible in the heroa, were favorites in the Alexandrine and post-Alexandrine periods.

The tombs of family heroes and kings were reequently distinguished particularly; since their remains were often interred in the vicinity of sanctuaries, or in the temples themselves, there likewise arose special tombs for them in the form of chapels and temples. Arkas, the tribal hero of Arcadia, was buried at the altar of the Temple of Hera at Mantinea; and Pyrrhos in the Temple of Demeter at Argos; Amphiaros' tomb was built in the form of a temple (see Valerius Maximus. VIII, 16); over Castor's grave in Sparta stood a sanctuary built for him. Aside from the evidence of the writers, considerable remains of the temple-like tombs are preserved. They chiefly consist of a massive substructure, to which steps lead and which contains the sepulchre itself; over this rose in proportion to the substructure a small columnar structure with a gable roof or one in the form of a stepped pyramid.

Rich figure ornament decorated the substructure as a frieze or was placed between the columns, as on the magnificent Temple-Tomb (so-called Monument of the Nereids) near Xanthos in Lycia; groups of figures crowned the apex of the pediment or the platform of a pyramid. The columns either support merely the roof, as for the monuments in Mylassa and Cirta, or they surround a small cell structure, as in Xanthos and Halicarnassos, or as three-quarter columns ornamented the angles of a cell, as on the Tomb of Theron at Akragas. The greatest astonishment in the ancient world was aroused by the Tomb of Mausolus in Halicarnassos. "It was so extensive and so beautiful in execution, that even the Romans were amazed at it and from it termed their own important sepulchral monuments mausoleums." (Pausanias. VII. 16).

The Nereid Monument is now regarded as the Tomb of the Lycian prince or Persian satrap Pericles, who took possession of the port of Telmissos about the 102 nd Olympiad. On a high substructure decorated by two figure friezes extending around above each other, rose the hieron, an Ionic peripteral struct-

structure of 4 × 6 columns with a double cell and entrance between antes, where to obtain space for the doorways, the Ionic columns are crowded back close to the antes. The entablature consisted of an architrave ornamented by reliefs and a cornice with dentils. The frieze was wanting, as in Lycian facades of tombs. Around the walls of the cell extended a frieze 1.41 ft. high and high reliefs decorated the pediments with statuettes at the apexes and angles of the pediment. Four marble lions guarded the entrance to the cell, and in the intervals between the columns of the portico stood the Nereid figures, to which the monument owes its name.(Fig. 491). Everything remaining of the sculptures executed in Parian marble was brought to the British Museum in London.

The tomb mentioned, that the Persian satrap, king Mausolus, had placed on the soil of Asia Minor for himself and his sister-wife Artemesia, busied at about the middle of the 4 th century B.C. all the most important Grecian artists of that time. (See Pliny, 36, 30, 31). Satyros and Pythis [1] are mentioned as architects; the sculptured ornamentation was entrusted to Scopas, Bryaxis, Timotheos and Leochares. The building still stood in good preservation in the 12 th century A.D. in the Carian port, until an earthquake partly overthrew it, and it was at last entirely destroyed by the Knights of St. John (1402 and 1522). In 1846, 43 relief slabs of the monument were found and taken to London; later in 1856, excavations under the direction of Newton brought to light numerous remains of architectural remains and of sculptures.

Note 1. See Brunn. Vol. II, p. 253, 254. (Pythis, Phythios, Phiteus, Phileos).

Pliny gives the height of the monument as 140 ft. and its perimeter as 440 ft, including the quadriga standing on the summit platform. Judging from the fragments, the statues of the building were about 8 ft. in height. Portions of more than 20 marble lions were found; also the highly famed torse of a mounted amazon is to be here mentioned. The reliefs were painted, and the facing slabs likewise consisted of kinds of marble of different colors.

On a high substructure rose a cell surrounded on four sides

by Ionic columns. The columns, 9 in front and 11 in depth, were moderately slender, slightly diminished, and surrounded by 24 flutes. The base has a bold torus above twio scotias connected by astragals. The volutes of the capitals are small; a necking member does not remain. The architrave is divided in three bands; the frieze is decorated by figure reliefs, and the cornice is enriched by dentils; the cyma was ornamented by anthemion ornaments and lions' heads. Above the cornice rose a marble pyramid in 24 steps, on whose platform stood the statue of the king and his sister with the quadriga. Traces of color were also discovered here on some fragments.

The Mausoleum has busied archaeologists and architects like no other monument. The materials for a restoration are lacking. Some fragments (three lions) are presented by the Imperial Museum at Constantinople, but most are in the British Museum in London. (See the enumeration of the pieces there in the little illustrated Catalogue. London. 1900; also Greek Buildings represented by fragments in the British Museum, by W. R. Lethaby. II. London. 1900). One contested point is the arrangement of the entablature. Did a figure frieze exist or was it wanting, since none such was found in Priene? The original finds exhibited in the British Museum suggest one; justly for me, and indeed for the following reasons:-- an entablature without frieze, according to the return on the architrave piece, which forms the uppermost facia, would assume two equally large egg-and-dart mouldings above each other, that does not look v very well on the upper moulding of the substructure of the Nereid Monument. Still less advantageous must be the effect of this arrangement, when the unusually projecting cornice rests directly on the architrave. This is 2.83 ft. high and according to the original blocks, its projection beyond the upper fascia of the architrave amounts to fully 3.33 ft. The architrave would already be shaded for a not very high position of t the sun, and the eave cornice would be crushing on the lower parts. Only the addition of a frieze makes this projection supportable, that is assumed too small in the recent restorations, contrary to the original block in London.(Fig. 316).

Of many older and later restorations, only that of Bühlmann

in Munich (1909) shows the building without a frieze. Those of Pullan (1862) (Fig. 493), Fergusson (1862), Petersen (1867), Bernier (1892), Oldfield (1895), Arnold (1896), Stevenson (1896), and Adler (1899) (Fig. 492), all prefer the figure frieze. Of those mentioned, only the designs of Bernier, Bühlmann and Adler are considered, which have a certain similarity in spirit. The statues on the substructure are shown with more talent by Bühlmann, but are rather dry in Adler's drawing. The arrangement of the stepped structure in two divisions, as preferred by Bühlmann and also by Bernier, is a happy and skilfully used idea. The stepped structure becomes technically possible, the composition is freer and nobler in its elevation, and the stepped pyramid is more permissible, whose form is most poorly handled in the design of Cockerell. The carrying up of the steps by others in a concave curved line, as done on the conical roof of the Tomb of Absalom and on some monumental tombs in Aquileia, would hardly indicate great facility.

It is worse for the attempts at the restoration of the interior, they are all neither esthetically nor statically acceptable, beind bad or technically impossible.

Notable is the connection of the steps by clamps (Fig. 104), which I give in accordance with the original finds in the British Museum, and which are alone correct from a photograph in the Essay of W. B. Dinsmoor in the April-June parts of the Archaeol. Inst. of America. Vol. 12. (1908). But his attempt to restore the ceiling of the cell is Barocco, on the other hand. For comparison are reproduced the two attempts of Adler and of Bühlmann in Figs. 492 and 493, to treat the exterior of the superstructure in accordance with the traditions.

In the same category of monuments with stepped pyramids should also be included the so-called Tomb of Theron near Akragas, the Lion Monument near Cnidos, but especially the Tomb at Mylassa. In this the portico rises above a bold square substructure, on which an entrance leads into the interior, whose stone beam ceiling is supported by four plain piers. On the superstructure of four angle piers, between which on each side stand two peculiarly coupled half columns, support the architrave with the frieze of ogee form, over which rose a richly decorated stepped stone ceiling in the manner of a stepped pyramid,

constructed by corbelling. Both columns and piers are fluted for two-thirds their height, and they exhibit the form of capital in execution still more corrupt than at the Tower of the Winds, that was found in the Theatre of Dionysos in Athens.

If the interpretation of the finder be proper, we have in the court of the recently discowered Council House in Miletus also to do with the interesting example of a "Tomb of Honor". That is characterized by a foundation 31.0 ft. long and 23.75 ft. wide, of limestone slabs with iron clamp bonds in cast lead. According to the fragments found, on this rose in the midst of the Bubeuterion surrounded by porticos on three sides, a structure reproduced in Fig. 494 after the drawings of H. K Knackfuss. (Das Rathaus in Milet. Berlin. 1908). On a base adorned with festoons rose the external walls, divided into panels by Corinthian columns set before them, and which were decorated by representations in relief. Above was a normal Corinthian entablature, consisting of architrave, frieze and main cornice.

It is assumed that this building further supported an attic (sarcophagus ?), but whose existence and shape is only approximately proved by finds. The date of its erection is later than that of the enclosing Council House with its porticos, which belong to the 2 nd century B.C. It is believed, that the pieces found should be recognized as portions of a Tomb of Honor, that dates from the time of the Roman supremacy. This would agree with the place of its location.

On account of the great number and of their different form and construction, the Syracusan rock-cut tombs are especially remarkable. "By them we can follow the changing nature of burial from the darkness of the oldest or Sicelian period through the centuries of the Grecian period until the time of the Roman rule and finally to the Christian catacombs. [1]

Note 1. See Holm-Cavallari. p. 310-327.

The Grecian tombs there found appear as grotto tombs, and in them constantly occur the characteristic memorial, the separate receptacles for the bodies (loculi), which may be cut in the rock, constructed of slabs, or may be sarcophaguses of terra cotta or of marble. The loculi were always covered by

slabs and their bottoms were sometimes perforated, to permit the escape of the fluid resulting from the decomposition of the corpse to a lower cavity. Just as characteristic are likewise the flat recesses above the loculi (Fig. 495), where is shown a perfectly developed sepulchral chamber of the street between the Latomia of Paradiese and of S. Venera.

As an interesting example of an architecturally treated tomb may be taken Fig. 496, designated as the Tomb of Archimedes, a tomb chamber of moderate size, whose plan forms an irregular rectangle, and whose entrance side is decorated by Doric architecture cut from the rock at a small scale. On two half columns rests a complete Doric entablature with architrave and triglyph frieze with a pediment enclosed by a cyma. The front wall between the columns, in which was the entrance doorway, is now destroyed. The space in the interior served for the deposition of entire bodies or the reception of bones or ashes. (Compare the great niche on the right of the entrance for entire bodies, the five arcosolias of the rear wall and the four of the left side, behind whose fronts were preserved the remains of bodies. The holes in the floor contained bones and ordinary Roman urns).

A monument of peculiar arrangement is found in the Heroon of Giolbaschi-Trysa. Walls of 12.48 to 21.0 ft. high enclose in rectangular form a terrace on the slope of the mountain (64.5 × 80.5 × 67.8 × 77.0 ft.), to which a single doorway (4.04 × 7.05 ft.) on the least side affords access. The walls are mostly coursed with trapezoidal ashlars, and the two upper courses are decorated by relief sculptures inside and outside, which are terminated by a plain crowning cornice, ornamented by an egg-and-dart moulding. The high external lintel of the doorway supports four strongly projecting winged bulls' heads; the jambs on the inside each support an almost life size figure of a dancer in a niche; little figures of musicians ornament the lintel. In the interior stands obliquely to the wall one of the well known Lycian sarcophaguses, that imitated a wooden hut. Outside the walls stand three others, two of which have the form of the wooden hut with gable roof and widely projecting gable, the theird having a pointed-arched roof. The

latter is almost 1-.4 ft. high, while the others have heights of 9.85 and 13.1 ft. The very interesting reliefs on the external south wall represent combats of amazons and centaurs, the war of the seven against Thebes, a landing battle; on the internal south wall are a feast, quadriga of the founder Bellerophon, the slaughter of the suitors, and the hunt of Meleager; on the internal north wall are the robbery of Leukippides, a hunt and the combat of centaurs; on the internal west wall are the battle between the shipyard and Troy; the storming of Troy, Achilles and the Amazons; on the internal east wall are combats of Antaeus, deeds of Theseus, and a feast.[1] (Figs.497, 498. Now a show piece of the Austrian Museum in Vienna).

Note 1. See Benndorf & Niemann. Das Heroon Giolbashi-Trusa. Jahrb. d. Kunsth. Samml. d. Oest. Kais. 1889-1891.

The Royal Tombs at Commagene are likewise peculiar. Near the Tomb of Sheshonk and above a subterranean sepulchral chamber rises a stone tumulus of about 410. ft. diameter, around which are three sculptures, supported by pairs of columns, which are so placed at the foot of the hill as to mark on the plan the angles of an approximate equilateral triangle. The pairs of columns are of the Doric order of the later period, each being composed of 7 drums and resting on square plinths; they are connected by plain architraves, on which stand isolated figures. (Two eagles and one male and one female figure, seated beside each other).

Another tomb near Kara-Kush shows columns in threes in the same arrangement, but which are not joined by a common architrave, each separately supporting on the abacus of the capital a seated lion and a relief slab with figures. (Fig. 499).

At a third tomb and at the foot of a tumulus about 459.2 ft. diameter, three terraces are built, that support figures of ancestors and of gods, built in 7 to 8 courses of stone to a height of 32.8 ft., and then sculptured; seated colossal figures with relief slabs, lions and eagles alternate. The location on the high top of a mountain is common to all these tombs. That last mentioned is widely visible, being placed on the Nemrud-Dagh, 6500 ft. high. [2]

Note 2. See Antiquites du Bosphor Cimmerien conservees au Musee Imperial de l'Eremitage. St. Petersburg. 1854. 3 vols.

folio. Also C. Watzinger. Griechische Holzsarcophage. Leipzig. 1905.

The tumulus of the heroic period again returns and casts its shadow on Grecian art at its end, just as on its beginning!

Finally should also be mentioned the wooden sarcophagus, ornamented with carvings, figures, painting and gilding, inlays of colored glass and marquetry work, with regard to its technical and art-industrial peculiarities; which was placed in sepulchral chambers of masonry. They are chiefly composed of four boards, two for the sides and two for the ends-- long rectangular chests -- with carved or painted ornament on a white or gray ground. Cedar, box, cypress and yew supplied t the material. The tombs near Kertch in the Crimea contained the richest materials of this kind, that were brought to the Hermitage in St. Petersburg; simpler forms were found in the Grecian cemetery near Abousir.

The objects from Kertch (Pantikapaeon) are unique of their kind and indeed exhibit the oldest works in joinery and marquetry, that exist in this way in the world. Their ornaments and figures indicate the 4 th century B.C. Thin veneers of boxwood, like the Etruscan mirrors, exhibit incised representations of figures in the highest perfection; gilded carvings in relief, perforated ornaments, eyes of green or red glass in the volutes of Ionic capitals etc. This older wooden furniture shows the same architectural forms as the great stone sarcophaguses (whose shape and mode of decoration were indeed transferred from the wooden sarcophaguses).

Watzinger collects a great number of such from Kertch, that exhibit external walls adorned by pilasters, half and entire columns of the Ionic and Corinthian orders. We likewise more frequently find the capitals composed of a different material, for example of stucco. Decorated ornamental bands (egg-and-d dart mouldings) are mostly executed in tougher and harder woods than the other parts. Above the cornices also occur small turned balusters already in this early period of the art industries.

With the most beautiful and richest pieces is indeed to be reckoned that published by Watzinger under No. 35, page 55,

with its latticed balustrades and colonnades, the little Niobe figures being in plaster; then that published in the splendid Russian work mentioned with its singular ornamentation recalling metopes and triglyphs.(Fig. 500).

A simpler and smaller original wooden sarcophagus is to be found in the collection of the Archaeological Institute of the University of Heidelberg, and another example from Kertch is in the Berlin Antiquarium. (No. 29 in Watzinger).

How far the art of joinery had advanced in these products and what connections were employed therein, evidence is given in Fig. 501, after Watzinger, a collection of joints in woodwork. Even today, we have nothing much better to show!

Closing Words.

The question is frequently asked today in artist circles; Wherefore the study, the research in architectural forms and constructions of ages long past, even if they are so beautiful in themselves, but originated under different conditions? Here is the answer, embodying an expression of Viollet-le-Duc.

Whatever has been done before you, that should you not ignorantly pass by; it is public broperty, an inherited possession, whose greatness and value one must know.

But add thereto, whatever you may from your own genius, collect together all thy power of thought -- but obey the demands of the time!

THE END.

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HANDBOOK OF ARCHITECTURE

Part II

ARCHITECTURAL STYLES

Volume 1

GRECIAN ARCHITECTURE

By Dr. Joseph Durm

Building Director in the Grand Duchy of Baden and Professor at the Polytechnic School in Carlsruhe

Second Edition

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HANDBOOK OF ARCHITECTURE

Part II

ARCHITECTURAL STYLES

Division 1

ANTIQUE ARCHITECTURE

Section 1

ARCHITECTURE OF THE GREEKS

PREFACE.

"In all arts and sciences not limited to a portion of their scope, but treating this exhaustively, everything appertaining to their domain must be examined. - - - - -

For it is a matter of impossibility, or at least exceedingly difficult, to become a thorough critic of what one has never practised."

Aristotle's Politics. Bk.IV, Ch.1; Bk.VIII, Ch.6.

With the existing multitude of valuable and thorough works on the Styles of Architecture, when a new attempt is made to set forth their nature and development by text and illustration, we believe that a new point of view may be assumed, if those ideas are chiefly placed in the foreground and emphasized, that are of special value and interest to professionals. Therefore a specialist will address the specialist first in the following; an architect will lay before the architect those things worth knowing, and will explain his observations and studies on the architectural masterpieces of those epochs and races, that have played a prominent part in the history of human civilization.

But this cannot be entirely derived from the various existing publications; it must be chiefly based on personal examination, on drawings and measurements of the monuments themselves, or they must be made with reference to tested reproductions compared with the originals, if a certain directness in perception and judgement is to be manifested.---- The search for a natural and historical path of development, and comparative researches on the building forms or products of the different epochs of art and civilization, will be substituted for speculative considerations and abstractions or hypothetical systems.

The restricted limits within which the entire work must be retained do not permit prolix esthetical researches in addition to technical explanations and historical representations; the authors must adopt a concise and simple treatment and thus briefly give the necessary historical survey, with those things possessing technical and artistic importance.

The knowledge of the monuments themselves cannot be made

exhaustive for all styles under the given conditionr, but nothing important or essential will anywhere be omitted.

In many cases, we have considered it necessary to describe the presentocondition of the monuments, as this appears useful for the decision of various controverted ouestions, and also for setting young architects aright, when preparing for a study tour, and for protecting them from illusions.

Doubtful reconstructions are on principle omitted, space being only afforded fro some examples, where the materials actually exist for a restoration.

2. The treatment of structural problems belonging to the domain of Engineering, such as aqueducts, shore and harbor works, bridges and fortifications, as well as a description of the products of Art Industry, must be omitted, though something concerning these objects may incidentally be given in some chapter of the work.

It perhaps remains to a later time to further extend what is here developed, and by means of an exhaustive treatment to bring it to a more perfectly harmonious conclusion, or to form a more complete whole, than is here possible.

We confidently lay the results of our studies before the the professional Architect, who has mastered the entire realm of Architecture, the Connoisseur and the educated Amateur, since we must accord equal value to the decision of the latter with Aristotle, because practising architects are not the sole and best judges on all points.

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TABLE OF DATES
OF ERECTION OF THE MOST IMPORTANT ARCHITECTURAL MONUMENTS OF THE STYLE

Date.	Egyptian	Asiatic.	Grecian.	Italian.
B.C. 3000	Pyramids of Cheops and Chefren. 4 Dynasty.			
2200	Beni-Hassan. Protodoric grotto-tombs. 12 Dynasty.	Babylon. Nineveh.		
1500	Great activity in building by 18 th Dynasty.			
	Campaigns into W. Asia.			
	Use of Vaults.	Phoenician merchants have extensive commercial relations.		
1300	Rameses II. 19 Dynasty.			
	Campaigns into W. Asia.			
1200		Trojan War.	Mycenae. Tyrins.Sparta (1200-1100 ?)	
1100		Emigration fm. European Greece to Asia Minor.	Doric immigration. (1124-1044 ?).	
1000		Solomon. Building Temple. (971) Tombs.		
900		Vaults in Nineveh.	Lycurgus in Sparta. (880?)	Rome founded 754.
800		Great palaces in Nineveh after 700. Phrygian rock-cut tombs.	Olympian games (776).	
			Greek colonies in Sicily. and lower Italy.	

Date	Egyptian	Asiatic.	Grecian.	Italian.
		Nineveh destroyed.(606).	Heraion in Olympia?.	T.Apollo and Artemesion in Syracuse.
600	Egyptian rule in Asia overthrown(604).	Destruction of Solomon's Temple(586).	T. at Assos? T. in Corinth.	Servian walls (578-34?)
		Croesus and	Solon(594).	
			Greek colonies from Black Sea to W. Mediterr. (Massilia).	Cloaca maxiima 580.
	Fall of Egyptian empire. (525).	Heraion in Samos.	Olympeion of Pisastratus(530). Hekatompedon on Acropolis in Athens.	
500	Extension of Persian empire over Egypt and W. Asia.	Tomb of Cyrus.	T. Apollo in Delphi.	Oldest T. in Selinus(600?).
			T. on Egina. (530).	T. in Metapontum. T. Poseidon in Paestum.
8.			Best period of Greek art. Pericles.(469-429).	T. in Selinus. Basilica and T.Demeter in Paestum. Paved streets and canals in Marzobatto.

Prominent Buildings in

Asia Minor	Greece	Sicily and Italy.
Miletus(494). Rebuilt 479.	T.Zeus in Olympia completed 456.	
Sardes(T.Cybele 440?).	Parthenon 447-434.	
Theatre in Assos.	T. Nike in Athens.437-432.	
	Theseion in Athens.	

Date	Egyptian.	Asiatic.	Grecian.	Italian.
			T. in Sunion.	
			Propyleion in Athens.437-432.	
			T. in Phigal- eia. 430.	T. in Akra- gas. 425.
400		Mausoleum in Halicarnassus. (351).	Frectheion. 423.	T. in Egesta. (410?).
		T.in Priene. (340).	T. on Ilissos. 400?	Gauls in Rome. 390.
		T.in Magnesia (330-300).	Stadion in Athens(250).	
		T.in Teos.	Chor.Mon.of Lysicr. 334.	Capitol and
		Lycian and Carian rock- cut tombs.	Mon. of Nikias and Thrasyllos 320-319.	Temples there.
	Extension of Maced. empire over Egypt	W. Asia and part of Greece. Under Alexander the Great.(331).		
			T-s in Nemea and Tegea.	
	Ptolemies.	Artemesion in Ephesus re- built.	Philippeion in Olympia(338)?	
300		Seleucides.	Stoa of Atta- los in Athens.	Tomb of Scipio barbatus, Con- sul 298?.
200		Attalos I. K. of Pergamon. (241-197).	T.Zeus Olymp- ics in Athens continued by Antiochus IV. (171).	Punic wars. Carthage dest- royed 146.
		Magnif.Build- ings of these monarchs.		First private house in Rome. decorated with marble(91).
100		T.in Aizani. Asia Minor a Roman prov- ince.	Corinth dest- royed.(146). Tower of Winds in Athens(100)	T. Fortuna Virilis.
		Herod builds T.at Jerusal- em(20).	Athens and Pi- raeus destroy- ed by Sulla(86).	T.Vesta. Found T. in Tivoli(72).

Date	Egyptian.	Asiatic.	Grecian.	Italian.
			Market Gate in Athens.	
30	Universal Supremacy of the Romans in World.			
A. D. 100		Jerusalem destroyed(70). Revival of cities in Asia Minor under Hadrian.	Athens restored under Hadrian. Arch of Hadrian. T.Zeus Olymp. completed(135). Seats placed in Stadion. (140). Odeion of Herodes Atticus. (140).	Palaces of first emperors. Pompeii destroyed. Colosseum.82.

9. THE ARCHITECTURE OF THE GREEKS.

1. Introduction and General Remarks.

If we examine the masterpieces of Grecian art in the domain of Architecture that have come down to our era, we find predominating in them two modes of building, sharply distinct during the best period, and which we designate by the names of Doric and Ionic.

Architectural traditions from Egypt and the interior of Asia are preserved in these.

The forms came to Greece already prepared to a certain degree, but there experienced that transformation, which proved itself to be for all time the highest degree of perfection of the expression of form, "so that they possess the character of an organic necessity, which sets them up as models, but not merely in a dead sense, as if incapable of progress and change".

Elements of both architectural forms indeed occur in the same buildings. Such a mixture with greater probability indicates the innocent commencement of the expression of form, ra-
10. ther than its debased ending.

11. From this combination is to be distinguished the well-known use of the already distinct orders in the same building, which never entirely ceased, even in the best period. For example, merely examine the Propyleion in Athens (432 B. C), light Ionic architrave in the interior rests on slender Ionic columns and supports the beams of the ceiling with the aid of the comparatively heavy Doric entablature of the western pediment, also the Temples at Phigaleia and Tegea, where in addition to the orders already mentioned, the so-called Corinthian was also employed, that order which latest assumed a fixed form.

The tombs in the valley of Kedron, the famous Tomb of Absalom, (combination of Ionic columns with a triglyph-frieze and an Egyptian-like cornice), Figs. 1 - 4[1], the Temple of Assos on the Aeolian coast of Asia Minor, (Ionic frieze decorated by figures and used as an architrave, above this being a triglyph-frieze), the Heroon of Theron in Akragas, etc., as well as various representations of architecture on ancient vases and fragments of pottery from Syracuse and Akrai (Triglyphs with dentils over them), pottery fragments from Olympia (regulas and drops with ornamental frieze over them; Figs. 5, 6), may

may serve as proofs of the statement previously made.

Note 1. Nearly all the illustrations to "Grecian Architecture" were made from original drawings, and for the greatest part from original sketches by the author.

The high antiquity of the tombs in the valley of Kedron asserted by De Saulcy[2], but attacked (see first edition of this work, p 8) is to no longer be accepted. I should prefer to adhere to the views of Göller[3], who believes in the originality of the Tomb of Absalom, but in Egyptian form as represented
12. in the next succeeding volume of this work (Fig. 59, p 67), and assumes a transformation into Greek forms at the time of Herod. But the high intiquity of Grecian terra cottas with this mixed style is not to be attacked, and just as little that of the Temple in Assos.

Note 2. Voyage autour de la mer morte et dans les terres bibliques. Paris. 1852-54. Also by the same author; Jerusalem. Paris. 1881.

Note 3. Die Entstehung der architektonischen Stilformen. Stuttgart. 1888. pp. 86, 87.

Grecian art did not occupy itself with the invention of new forms, but with the sifting of those received or acquired, and in their idealization. It could only reach that high perfection of form in the course of time and by steps of transition. Therefore we need not look on perfected Grecian art as a direct development of that formed or existing earlier; it is rather the result of a new intellectual tendency, which shaped its peculiar forms from those already existing, from which may also not be excluded the realization of individual elements, peculiar to the native races.

The Orders (the modern designation for the individual varieties of the developed architectural style) are the result of similar mental exertions, which created an orderly separation in what was received as a confused combination. Formative art here proceeded from the remains of more ancient native and foreign elements; we everywhere find the signs of its secondary origin.[4] Every people adjoining another nation further advanced in civilization will borrow of that one and appropriate its arrangements; absolute originality cannot exist for a less fully developed civilization, or one entirely undeveloped, if one more fully perfected be near it. But experience in all domains of

Art teaches that imitation precedes originality, which first appears, when after what has been received, the power of creating something is also possessed, and the Greeks had that power!

But the civilization of central Asia and of Egypt was already developed before the idea of adorning Greece with art works arose. These countries were not isolated; they imparted their acquirements to other nations. The Phoenicians, the people of Sidon and Tyre, were the element that transmitted civilization; Asia Minor formed the bridge between the civilizations of Mesopotamia and Greece.[5]

Note 4. Semper. Der Stil in den technischen und tektonischen Künsten. Munich. 1860-63. 2 d edit. Lief. 1-8. 1879. (Unfin.).

Note 5. See on this point, Milchhöfer. Die Anfänge der Kunst in Griechenland. Studien. Leipzig. 1883. Introduction, pp. 1-4.

Thus the forms and orders of Grecian architecture did not spring forth entirely perfect, as did Pallas Athene from the head of Zeus; their splendid fruits were but slowly ripened; the various steps of the progression towards maturity are unfortunately in great part incomplete, or have entirely disappeared.

Because they are not entirely original, and also that the comparison is very seldom made, the severe forms of the Doric, and the graceful ones of the Ionic style have no connection with the character of the people. The Spartans, for example, are usually taken as representative of the Doric race; every art industry and handicraft was prohibited among them as being unworthy of free men; their architects were therefore foreigners or subjugated Achaians; the Dorians of Corinth and Syracuse were accounted among the most luxurious and unrestrained of all the inhabitants of Greece. The men of Tiryns, builders of the gigantic walls there, were considered silly and worthy of ridicule.[6]

Note 6. Braun. Geschichte der Kunst etc. Wiesbaden. 1856-58. 2 d edition by Reber. 1873.

The noblest architectural works in Greece are further not due
/3. to the wishes of the people, but to the understanding and the s strong wills of the few--highly educated rulers --, thus in Athens, to Pericles, that monarch under the cloak of a republic.

As for so much eminence and grandeur, the greater portion was not produced with the concurrence of the majority, but rather in opposition to their will and desire, also a very frequent occurrence among us Germans at the present time. Com-

pare this with similar phenomena in the golden age of the Renaissance.

"He gilded and decked out our city like a vain woman; he squandered all the money and ruined the finances", was said of the man of his era, who made Greece immortal. However highly the work was esteemed, much as individual artists were honored by the personal friendship of patrons in high station, still a passage of Plutarch throws a peculiar light on the social position of the artist; "the personal pursuit of a low occupation is an indifference to the Better. No youth of noble nature has looked on the Jupiter in Pisa or the Juno in Argos, and therefore desired to become a Phidias or a Polyclete. Just as little would he wish to become an Anacreon, a Philetas or an Archilochus, because their poems pleased him".[7]

Note 7. See the still more severe opinion in the 4 th century B. C. in Aristotle's Politics. Translation by C. & A. Stahr. Stuttgart. 1860. Book VIII. Von der Erziehung, 2,3,4,6,7.

2. Influence of Building Materials.

The formation of an architectural style is less affected by the character of the people, than by the building materials at the disposal of the people or of the individual for the embodiment of their architectural ideas. To a certain degree, every architectural style must be considered as being the product of two factors; these are the genius of the master and of his era on the one hand, on the other being the nature of the materials afforded by nature.[8]

Note 8. See Suess in Hauenschild. Katechismus der Baumaterialien. Part 1. p 3. Vienna. 1879.

3. Influence of the Climate.

The climate of a country does not absolutely control the artistic form of an architectural style. The Ionic and Doric architectural forms, originating in the sunny and luxuriant soil of Asia, received from the fertile, hot and rainless Egypt, struck root and bore flowers and ripe fruit in the strong stony soil of Greece, never remarkable for its luxuriant vegetation; they even endured the severe climate of a country, in regard to a part of which Hesiod sings: "where the winter is bad, and the summer is also evil, and nothing is good. Here is no longer the most pleasant change of the seasons of the year, as Herod-

otus boasts in regard to the Ionian shore. The skin of a little buck, sewn with ox sinews, is thrown over the shoulder as a protection from rain and snow, and a shaped felt hat is drawn over the ears, that they may not run. On the other hand, the plough and sickle are used in summer in a complete nudity, and the burning of the dog-star is such as to dry up the marrow of the man". Attica, with its sparingly watered stony soil and thin covering of earth, is also called the "stony" or the "rough" (kranaa) by the poets.

The graceful filagree-like, perforated, often heaven-aspiring and finely detailed architecture of the Gothic style, with its abundance of gutters and joints for collecting water and snow, is with difficulty brought into accord with our northern climates, and produces important evidence against the acceptance of a connection between architectural forms and climate.

14. Porticos, loggias, balconies and bay windows, are as native to the north as to the south; the bay window is a characteristic peculiarity of the ancient Arabian[9] and of the northern Gothic dwelling.

Note 9. See Ebers. Aegypten in Bild und Wort. Stuttgart & Leipzig. 1879-80. Street in Suez. II. p 29. Street in Cairo. II. p 108. Street in Coptic Quarter. I. p 198.

4. Wooden and Stone Architecture.

Like its precursors, Grecian architecture became a stone style, and it is actually a fact that most Grecian settlements were located, where an abundance of serviceable stone was to be obtained very near at hand; as examples, take Mycenae, Athens with the adjoining limestone quarry of Lycabettos and the Pentelican quarry but a few hours distant, Syracuse, Akragas, Selinus, Ephesus, and other places. It could become a stone architecture only by preliminary steps and transitions, just as was likewise the case with its forerunners, those of Egypt and of Asia Minor.

Wood and clay (loam) are the first building materials in countries without stone, or at a time when men did not understand how to cut stones, and textile fabrics, wood, and metal, are the recipients of architectonic ornamental forms.

5. Egypt.

For the precedence of a wooden to a stone architecture, the rock-cut tombs of +eni-Hassan in Egypt bear witness, whose corn-

ices imitate wooden construction.

In the structures which served as models for these tombs, the wooden columns had already been earlier replaced by stone columns, leaving with the latter the form of cap remaining between the column and beam as evidence of their origin.(Fig. 7)

Thus originated there at a certain time the mixed method of construction with wood and stone, in place of which was later introduced that entirely of stone.

6. Asia.

In the ancient monuments of Susa and Babylon is preserved the original type of the Asiatic system of construction. Thick walls of sun-dried bricks connected by vaults or terraced roofs,
15. according to whether wood was available or not, characterize them.

Trunks of trees served to cover as well as strengthen the masonry, and a facing of burned and glazed bricks protected the sun-dried bricks from destruction. Tunnel vaults and pendentive domes were already built at the era of Darius. Cuneiform texts speak of posts of cedar wood, decorated by gold leaf, which supported a wooden roof covered with the skins of animals.

The Bible tells us of the wood-work of Solomon's Temple and Palace, with the use of stone for the substructure at the same time, and Strabo admits that in Babylon(for lack of stone) the columns were made of plam trunks.

7. Cyprus.

The combination of wood and stone may also be shown in the ancient Cyprian temples.[10] The Temple at Agios Photios was built before Grecian influences, very simple in architecture, the cella entirely constructed of unburnt bricks, thickly plastered inside and outside and colored, in accordance with a custom preserved there until this day in the building of porticos and peristyles, had the shafts of the columns of wood, while the bases and capitals were made of stone.

Note 10. See Cesnola. Cyprus.

Also compare the system of construction handed down in Lycia, as it is still preserved in the lowlands, an example of which is given in Fig. 8.

16. 8. Lycia and Persia.

Later stone columns in Asia Minor incontestably bear the stamp of their wooden origin and are in some sense the archaistic model

of the Ionic column.

The Lycian rock-cut tombs even slavishly imitate the ancient wooden house, from which stone monumental construction later developed under changed conditions, which already operated more freely on Persian monuments, while all ornaments on the latter are suppressed,which would too strongly recall the abandoned wooden construction.

9. Thin and Thick Columns; Close and Wide Spacing.

Where in nations found in connection with Egyptians and Asiatics, and who received their civilization from the former, columns came into use in architecture, the "thin columns" are to be referred to Asiatic, the "thick columns" to Egyptian origin.

Close and wide spacing then depend upon the nature and resistance of the columns and of the supporting beam resting on them.

10. Greece

We learn from Homer's poems, that enclosing and division walls were built of stone, and that these were covered with wood, metals and tapestries. The roof consisted of beams with a layer of clay, where the ceiling beams were made of fir wood and were borne by beams resting on posts or columns.

According to the evidence of this and other writers, the following methods of construction of religious buildings may now be determined.

11. Wooden Temple.

1. The Wooden Temple, which is not invariably to be regarded as evidence of the highest antiquity; for the means at command and the building material found at the locality decided the material execution, as at present.

For this may be cited:-- the single wooden column in the Heraion at Olympia (Pausanias, V[illegible], 16); the Sanctuary of Poseidon Hippios near Mantinea, built of oaken beams by Agamedes and Trophonios (Pausanias, VIII, 10); the Column of Oenemaos, cracked by age and held together by iron bands (Pausanias, V, 20); the Temple of Hera in Metapont, whose columns were of wild grape vine wood. (The grape vine, on account of its size, was rightly classed among the trees by the ancients. Plinius. Hist. Nat. XIV,2).

"On the market-place of Elis, I saw another form of temple, low and without walls, the roof borne by oaken columns. That this is a tomb is the unanimous belief of the inhabitants", Pausanias further says. (VI, 24).

12. Metal Temple.

Here should also be placed the Metal Temple or that covered with metal, whose former existence was attested by Plutarch and Pausanias, by the citation of the Temple of Athena Chalkoides (5 th or 4 th century ?) and by the statement, that the third Temple of Apollo in Delphi was constructed of metal(648 - 645).

13. Temple of Mixed Materials.

2. The Temple built of wood and stone combined, in which the substructure with the enclosing walls and free columns were of masonry (stone, bricks or sun-dried bricks), but the beams, roof, and the cornice were of wood, when the latter was usually covered with bronze and terra cotta (Metapont), a custom later transferred to stone monmments (Treasury of Geloans in Olympia, Temple in Selinus). This system of construction may be designated as an experiment, a period of endeavor, of progress, and of development of temple architecture, a progression to the final form.

14. Masonry Temple.

3. The Masonry Temple, in which the entire external architecture was constructed of stone, and only the structural parts supporting the covering of the roof (purlins and rafters) and at most the ceiling of the cella (not the ceiling of the columnar portico) were built of wood.[11]

Note 11. See further, Chipiez. Histoire critique des origins et de la formation des ordres grecs. Paris. 1876.

The Greeks attained to an exclusive stone construction, like the Egyptians, in only a few monuments (Tower of Winds, Choragic Monument of Lysicrates, and others). The climatic differences of the two countries required in the former the gable roof instead of the horizontal roof of stone slabs, and the Egyptians had already long prohibited the use of wood in their religious monuments, when the Greeks commenced to use fluted stone columns. This indeed occurred in the time of the rule of Psamtik, when Egypt was opened to foreigners.

Chipiez[12] and Dieulafoy[13] believe that the date of the earliest Doric stone temple should not be placed earlier than in the 7 th century (Paestum and Selinus, end of 7 th century, Metapont and Akragas at end and beginning of 6 th century).

Note 12. See Note 11.

Note 13. L'Art antique de la Perse, Achamenides, Parthes, Sassanides. Paris. 1884-85.

15. Building Materials of the Masonry Temple.

In relation to the materials of the masonry temple, Pausanias states that the (then alread roofless and ruined) Portico of Kotys in Epidauros was built of unburnt bricks, together with a small Chapel of Asclepios in Panopeus in Phocis, and the Temple in Stiris in the vicinity, cities without market-places, gymnasia, theaters, or water, where men dwelt in low huts, like mountain cabins and near a torrent. We likewise mention here the upper portion of the walls of the cella of the Heraion in Olympia and a part of the walls in Troja (Hissarlik).

The ancient Temple of Apollo in Megara (later rebuilt in marble by Hadrian), a Temple of Proserpina in Argos, and the Philippeion[14] in Olympia, were built of burned bricks. On the roof of the royal hall in the Keramicos in Athens were mentioned Sculptures in clay like statues. For the extended series of architectural works in Greece further enumerated by him, porous or crystalline limestone is designated as the structural material; Eleusinian, Pentelican and Parian marbles for the monuments of Athens, local tufaceous limestone for the Temple of Zeus in Olympia, and tufa for the terraces in the Altis there. Local stone is briefly designated for the Temple of Athene in Pellene; the circular walls of Ambrosus were of black local stone; the buildings in Bassae, Mantinea and Tegea were famous for their beauty and for the jointing of the stones; in Megara is noted a unique and extremely white shell marble, softer than common marble. The neighboring quarry of Koressos furnished the magnificent white marble for the Temple of Artemis in Ephesus, and the Latomia within the walls of Syracuse supplied for its buildings an excellent light gray porous limestone (like the Paris stone of our time). A yellow
18, and yellowish gray porous limestone was employed in Akragas, Selinus and Egesta (similar to the Jaumont stone of Metz), both kinds being by their structure well suited to receive a durable coating of stucco. All the kinds of stone named could be quarried in blocks of any desired dimensions.

Note 14. According to the excavations, the Philippeion consists of porous ashlars, whose red coating of stucco is still preserved.

16. Development of Forms.

The formal development of wooden and stone forms, of terra

cotta facings, metallic coverings and ornamental pieces, their origin, derivation, and transformations, will be treated under the forms and construction of the chief parts of the different orders. It will here only be generally stated that certain allied relations between wooden and stone structures may always be pointed out in their appearance; in both cases, they are built with posts, columns and beams, to facilitate repairs of supports and ceiling. Therefore similar ornaments also occur on the elements in both materials, which are used in like ways. For this reason, the ceiling beams in both methods of construction must likewise show similar forms of cross section; stylistically correct decorations of the wooden free columns must follow the direction of the fibres, and therefore on these columns, just as well as on stone columns, these may consist of flutes. The same is true of the fascias of the architrave. Ceilings and roofs may both in wood and in stone be composed of structural elements lying horizontally or resting inclined against each other. In the latter way, the ceiling of the very ancient Sanctuary of Apollo on Delos is composed of stone slabs (Fig. 9). The same thing occurred at the entrances to the tombs of the Egyptian pyramids (Fig. 10), and also in a later monument, the Tower of Winds in Athens (Fig. 11). Compare also the buildings in the Hauran and the stone corbels at the overhanging stories of certain Florentine buildings (Via porta rossa).

17. Oldest Structures of Masonry. (Heroic Period).

The stone structures to be regarded as the oldest on Grecian soil are the massive walls of Tiryns, Mycenae, and Argos, the first of these being probably already constructed 12 centuries B. C. and ruined by the Argives about 468 B. C. We find similar walls in Asia Minor at Kalynda and Iassos in Caria, partly
19. laid in regular, partly in random courses, also on Cyprus, Rhodes, Crete, in the Delta of the Nile, and in southern Italy. Who constructed them? Were they members of workmen of a certain race, whose home became too crowded, and seeking new dwelling places or employments, they took their way over the coasts of Asia Minor towards Europe, leaving behind them these vestiges of their industry?

Or are these similarly constructed walls in the localities mentioned independent of each other, similar results of like conditions, produced by nations building in stone?

But similar walls are also found in China and on the table land of Peru. Cuzco, 12,858 ft. above the sea (capital of the Inca kingdom and conquered by the Spaniards in 1533), exhibits considerable remains thereof; these are the ruins of a great Temple of the Sun (Ynti), on whose site now stands a monastery, and the ancient Palace of the Incas. We are here amazed by the accurate jointing of the very large blocks of granite and porphyry of irregular form and laid without mortar. The fortifications of the neighboring Cerro (Ollantay Tambo) are also wonderful, the exquisitely wrought stones of which must have been transported across the river from the quarry 2 leagues distant. The stone walls are composed of blocks of hard granite, up to 7.65 ft. wide, 12.3 ft. long, and 6.56 ft. or more in thickness. Colossal slabs of stone with reentrant polygonal angles alternate in the lower portion of the wall with smaller polygonal intermediate blocks, while materials of more nearly equal dimensions are employed above these.

But the walls are not merely constructed similarly; their openings have the same form as in Egypt, western Asia and Greece, the upright trapezoidal form of doorway diminished upwards. In some cases, the so-called "ears" are even clearly indicated; the pyramidal batter of the wall and the decoration of the doorway by sacred animal forms in relief are also to be found.

One step further:- if we consider the objects of art industry found in Peruvian tombs, we here find ornaments and patterns,
20. whose affinities in form with Egyptian, Asiatic, and Grecian, motives cannot be denied. The chess-board pattern, the fret, etc. occur in a perfectly developed state on textile fabrics and tapestries. The combination of colors therein is generally very happy; fringes of thin cords are found, as well as tassels of wool and cotton, and borders of small pieces of mother-of-pearl or gayly colored feathers are sewed on the edge of the tapestry, upon whilh thin plates of gold or silver are frequently sewn, -- embroidery work as found on the very ancient Assyrian garments. Engravings on copper weapons very distinctly represent the waves of the sea, that characteristic Egyptian and Grecian decoration!

Also on Chinese pottory of ancient times and on Mexican pottery (now in the British Museum) are found ornaments, that pos- striking resemblances to the Grecian; the fret pattern from

Yucatan leaves nothing to be desired in perfection of form in comparison with the Grecian, even as little as the Mexican sea wave pattern and also the recurved ovate leaf (Fig. 12).

The centers of civilization in the New World are on the table lands of Peru, Cundimarca, and Mexico, but in the Old World they are always in a level country! Is there really a connection between these works of the New and Old Worlds, allied in structure and form, but separated by nearly 3000 years? This much is certain, that when Europeans became acquainted with America, the so-called copper colored and peculiarly characteristic American existed there; did he belong to an Asiatic race,
21. which had immigrated in undetermined past ages, or have we to consider a copper colored Adam? the keys are not lost; I believe in no connection here in the first place, for similar ideas are everywhere the result of similar needs, and a wish to conclude that certain similar monuments in different parts of the world are due to the same authors, is at least deceptive.

The same diea is expressed by Virchow in his preface to Schliemann's Ilios:- "But experience has taught us how uncertain are archaelogical "guiding muscles". The human mind finds in different localities the same things and in the same place different things. In the same period are developed certain artistic or technical forms without any connection between the artists or workmen."

The Phoenicians were already settled on the coast of Syria in 2000 B. C., and they transported the developed civilization of Egypt and Babylonia to all the shores of the Mediterranean Sea; acquisitiveness led this mobile Semetic race to Great Britain and India. Its proud cities have disappeared from the earth; but vestiges of their activity in building are preserved for us in the noble ashlar walls on the island of Arvad and near Marathus; remains of temples on Malta, Gozze, and at Amrith are further evidences thereof, as well as the massive substructures on the shore and in the Citadel of Carthage, and in the retaining walls of the Temple of Solomon, constructed about 1014 B. C. The wall with closely fitting joints is built of great blocks, moderately bonded; these blocks have drafted margins with rough projecting faces.

Similar characteristics are found in the old walls on the Argolic Gulf; Euripides says that these were in accordance with

Phoenician rules of building. The Phoenicians and Carians are named as the earlier inhabitants of the Greek islands. The latter were often intimately connected with the Hyksos, who ruled in Egypt, and they settled in the Greek islands after being expelled from Egypt. Mention is made of the immigration of Phoenician and Egyptian colonists into Greece. Pelasgians also make their appearance; they are now barbarians, now ancestors of the Hellenes, then a Hellenic race. We will not linger in the foggy and dangerous path of ethnographic research; I conform to Schliemann's view, that the name Pelasgian was originally the designation of some one of the many races, which formerly inhabited Greece, and that this name was later employed as the most general appellation of all Prehellenic races, without regard to its true ethnographic relations. But the Hellenes, which we thus oppose to the Pelasgians, were doubtless nothing more than a single member of the series of allied races comprised under the common name of "Pelasgians".

This masonry is termed Pelasgian and also Cyclopean. Semper calls it polygonal masonry.

We find the walls here considered to be constructed of irregular blocks with spalls in the interstices of the joints, or of carefully wrought polygonal blocks; others consist of horizontal courses of stones (Fig. 13), whose end joints are not always vertical and whose bed joints frequently encroach on other courses. All three kinds occur at the same time. Schliemann divides them into walls of the I, II, and III epochs, but also considers them as contemporary.

22. What was the purpose of these gigantic walls? Among the Phoenicians, they served as dykes and quays, as protecting walls, and as substructures of temples; in Argolis, they were bulwarks for offense and defense, the beginning of a civic commonwealth. Accordingly as each man readily abandoned his dwelling place in earlier times, when compelled by a stronger man, since there was no commerce nor rational agriculture in Greece and no wealth to be acquired, but merely existence to be prolonged, yet circumstances were changed, when men strove for money, fortune and profit. Acquisitions must be secured, protected, and defended from mankind, to whom gains won quickly, boldly and without toil were preferable to those earned by the industry and labor of the hands; defended against robbery, a vocation

conferring fame and not disgrace. The possessors gathered together; the poorer entered the service of the richer; the strongest led and ruled the originally small corporate body. Mining and defense took place behind the walls mentioned, and these circumstances thus gave occasion for strong dwelling places enclosed by walls. Thucydides places the oldest cities far from the sea, those founded later close to it, the former protected by their natural situation, the latter by walls.

Thus may conditions have probably been in Greece at the time of the Trojan War (between 1200 and 1100 B.C.), the first general and politically important undertaking of the Hellenic race.

18. Walls of Tyrins.

The lower circular walls of Tyrins, whose materials were taken from a stone quarry about a half hour distant from the city (see what was said of Settlements), belong by their construction to the most primitive masonry.

The stones are of the most diverse sizes, just as they came from the quarry, without any further work on the end, bed, or face surfaces, and are laid in courses without any cementing material; the interstices produced by the courses are filled with small stone spalls also laid dry. The larger blocks measure 4.92 to 6.56 ft. long and up to 3.28 ft. high (Fig. 14). The walls must originally have had a height of 59 ft. in some places.

The casemate-like galleries and their vaulting within these walls are unique. Their clear width averages 6.5 ft.(exact measures are impossible in consequence of the rough and uncut surfaces of the stone), with a height of about 9.84 ft. The walls are composed of three vertical courses, and the ceiling
23. is of two courses of ashlars on each side corbelled out beyond each other, the rude and rough blocks of the uppermost one being bonded together at top, and resting against each other in an arbitrary and inexact manner, resulting from the accidental forms of the stones. With the rude shapes of the stones, this kind of vaulting can just as little be termed pointed-arched, as can the triangular openings in the external wall of the gallery, also formed by corbelling and extending down to the ground. Similar wall openings are found in the regularly coursed walls of an ancient structure near Missolonghi.

19. Walls of Argos.

Cyclopean walls of a perfected type, very carefully executed and coursed with polygonal ashlars, are found on the slopes of the steep and bare rock, on which stands the citadel of Larissa, the former fortress of Argos; they terminate a series of ancient monuments, which extends in the vicinity of the present city. The material is a limestone, now shining with a fine cool gray and glowing with warm tints in other places, that comes from the immediate vicinity. The faces of the larger blocks are 3.81 ft. by 4.27 ft. to 5.91 ft., with neatly projecting faces free from great irregularities and unevennesses; the faces gently curve at the edges, which are dressed with great exactness, showing the very close contact of the stones in the well preserved portions. Mortar is also not employed here. The indenting of one stone into another is frequently quite artificial; the external surfaces of the ashlars are irregular pentagons, hexagons or heptagons. The lower cornerstone of the wall bears on its outer surface a nearly unrecognizable low relief (a sitting figure about 1.18 ft. high), above which is an obliterated inscription (Fig. 15).

Braun and Semper recognize the latent principle of the arch in this irregular network of ashlars subject to tension and compression. The blocks do not rest on each other as in walls of ashlars in horizontal courses; they actually form arches under compression on account of their peculiar arrangement. I may question whether this was the reason for the complicated jointing; the peculiar forms of the materials probably supplied the leading motive therefor. The limestone ashlars or breccia-like stones, of which most polygonal walls are constructed, always have a short conchoidal fracture, and the roughly broken ashlars always have a rounded face, which is most readily and econ-
24.
omically dressed with short sides. Materials in strata and breakink into regular blocks is never used for polygonal masonry; compare the retaining walls of Jerusalem, built of ashlars from the Lebanon (Fig. 13).

Viollet-le-Duc believes these polygonal walls to result from the accidental forms of the quarried stones or boulders; therefore the broadest stones are placed at the bottom in the first course on the ground; the angle between the stones already set is measured by a bevel, and a stone with about the same angle

is sought and fitted there; the same process is followed for the succeeding courses(Fig. 16).

20. Walls of Mycenae.

Mycenae near Argos exhibits the third kind of Cyclopean masonry; the finest remains exist in the side walls of the so-called Treasury of Atreus and in those of the Gate of the Lions, which forms the entrance to the Acropolis. The stone quarry is also here in the immediate vicinity; the material being supplied by the slopes of the two-peaked Mt. Euboa 2297 ft. high, which surrounds the Argolic amphitheatre. The blocks are laid in courses, neither exactly horizontal nor quite parallel, the end joints not being always vertical, and no mortar is used. The faces of the ashlars are parallelograms or trapezoids; the external surfaces are made tolerably even, so far as permitted by the nature of the material; the stones are somewhat curved towards the edges, so that the joints do not exactly fit. The ratio of height to length varies from 1 to 2 or 1 to 3, to 1 to 2.5-4 and 1 to 5. The lintel of the doorway is one of the largest wrought stones ever used in architecture. The stability of this masonry chiefly depends on the use of the largest blocks possible, besides the bonded coursing.

The lintel of the Gate of the Lions is 14.76 ft. long, 7.87 ft. wide, and 3.67 ft. high at the middle, its upper side being curved, and it has a clear length of 9.35 ft., the opening being about 0.74 ft. narrower at top. It is not loaded by the masonry above it, but the originally 5 courses are corbelled out to relieve it. The resulting triangular opening in the masonry is then closed by a slab, bearing the most ancient monumental sculptured decoration in Greece. The feeling, that demanded the fine and careful treatment of the ashlars, must also have required the use of sculptured ornament, as we have likewise seen in completed masonry at Argos. The relief slab shows two bases placed very near each other and covered by a common stone; (Schliemann believes this to be an altar); from this a column rises in the central line of the triangle, whose base is formed by a slightly projecting slab, its greatly injured shaft being joined to the capital by a feebly expressed apophyge. The column was originally diminished very slightly downwards. In the present condition of the original (not the plaster cast), it is hard to accurately determine the amount of this diminution.

The capital consists of a square abacus, beneath which is a heavy annular torus, a gentle transition existing between this and the angles of the abacus or the projecting triangular surfaces; below this is a calyx-like member terminating with an astragal next the shaft. On the abacus lie four rolls, represented in front as circular disks (similar to those mentioned on Lydian sepulchral monuments), above which is a square slab from which a sculptured flower probably arose, as may be seen in analagous representations on ancient coins. Two animal forms, said by Pausanias to be lions, stand on the pedestal and extend towards the column. Their heads and the upper portion of the triangular slab no longer exist. The peculiar fractured surface and also the metallic dowells for the heads show that these heads were not of one piece with the slab, but were fastened to it. The small space remaining on the slab proves that they must have looked outwards from the relief. It is conjectured that the heads were of metal, and this may be true. The treatment of the muscles and the soft forms of the bodies, as well as the tails without tufts, recall[15] Assyrian perceptions and mode of treatment (Fig. 17).

Note 15. Compare the allied Phrygian monuments, the ivory hilts of Menidi, and the island-stones of Crete and Rhodes. See:-- Jour. of Hell. Studies. Vol. 3, Pls. 17, 18.

21. Phoenician Masonry.

Of especial interest is the Phoenician masonry of the Temple at Hhagiar Kim, about 4 1/2 miles south of the village of Krendi on Malta. Enormous slabs of stone set upright first enclose a semicircle, above which commences the horizontally coursed masonry of great oblong blocks, an arrangement retained in principle in the cella wall of the Grecian temple of the best period. The Temple of Poseidon at Paestum, the Temple of Zeus at Olympia, the Parthenon, the Theseion, the Erectheion, etc., have first above the ground the space-enclosing courses of stones set on edge, above this being only the bonded and coursed ashlar masonry.

In the Temple of Melkart, the masonry of large stones is composed of irregular blocks, one set on another, only restricted
26. by the dimensions of the blocks; no cementing material is any-
27. where used between the separate stones.

These ancient stone monuments of Phoenician and Pelasgian ori-

gin are so grand and mighty, that one may perceive and be astonished at their expression of an architectural formative power, though rudely acting, although they were equalled and frequently excelled in expression during the Renaissance period by the gigantic palaces of the Florentine nobility. Ashlars 26.24 ft. long, as in the Pitti Palace, with bosses projecting 2.95 to 3.26 ft., as in the masonry of the terrace of the same palace, were not often found or excelled in antiquity.

Polygonal masonry is frequently considered to be a criterion of great age, but various monuments prove this to have been employed in later times in nearly all periods of the Roman empire, both in Asia Minor and also in Greece.

22. Dryopic Walls.

Another kind of masonry requires mention, the so-called Dryopic masonry existing in the remains of ancient buildings in Euboa. Its peculiarity is due to the nature of the materials. Long slabs, breaking proportionally thin and left rough on all sides as quarried, are laid on each other without mortar in courses, leveled up and the joints are filled with small stones. The walls therefore have a thickness of at least 6.56 ft.

23. Walls of Artificial Blocks.

For the walls of sun-dried bricks mentioned by Pausanias, manifest evidence has been found since the discoveries in heaps of ruins at Hissarlik.

The bricks are bonded in courses; the masonry is strengthened by wooden anchors built in and is constructed as in Fig. 19. The unburnt bricks are made of clay mixed with chopped straw and have a thickness of 3.9 to 5.9 ins., with a length up to 25.6 ins., while the clay mortar joints are from .39 to 1.18 ins. thick. The surface of the wall is frequently covered by a thin white wash of clay (like pipe clay)[16]

Note 16. See Durm. Zum Kampf um Troja. Berlin. 1890. Reprint from Cent. d. Bauverwa 1890.

28. 24. Palaces of Rulers.

Palaces of Rulers, Citadels, dwellings of powerful individuals, strongholds for the safekeeping of acquired wealth and the preservation of ornaments and treasures, monumental sepulchres of rulers, memorials for posterity, all these remains of buildings are of architectural importance.

We are only acquainted with the first by means of the Homeric

poems, from which we must conceive the palaces of the rulers to have been somewhat finer, than would be supposed from the defiant and rude fortress walls, if Thucydides be not mistaken, when he says (of course in reference to another point), "It should be understood that Homer, as a poet, exaggerates the greatness and beauty of things."

The Palace of Menelaos at Sparta gleamed with bronze, silver, gold, amber and ivory; walls plated with bronze, leaves and jambs of doors overlaid with plates of gold and silver, are found in the Palace of Alkinous.

Homer calls Mycenae "rich in gold"; Thucydides mentions the great treasures of Pelops, brought from Asia by him, and that made possible his power and the assignment of his name to this portion of the country; his descendants, the Pelopides Atreus and Agamemnon, should be considered as "augmentors" of the possessions of the family until the breaking-out of the Trojan War. 25. Royal Palace in Tiryns.

25. Royal Palace in Tiryns.

The Homeric descriptions were succeeded by the results of the excavations in the Citadel of Tiryns,[17] at Mycenae, and at Troja, which are aided by our presentation of a ruler's palace, even if this be merely based on a ground plan. The latter (Fig. 20) exhibits the arrangement of the walls of the upper Citadel, as it appeared with its massive fortifications on the isolated hill-top, rising from the plain. The ashlars of these are limestone blocks, roughed or more smoothly dressed, frequently set in horizontal courses, and are set without mortar, as commonly done in antiquity, which would have had but a limited value in thin layers with the dimensions of the blocks.[18] In the lapse of time, the joints and cavities have become filled with dust and clayey earth, which has suggested the use of clay mortar, but which would indeed have been no better than ordinary lime mortar.

Note 17. See Schliemann. Tiryns. Prehistoric palace of the King of Tiryns, etc. Leipzig. 1886.

Borrmann. Die Burg von Tiryns. Cent. d. Bauverw. 1886. p 89.

Schuchhardt. Schliemann's Ausgrabungen in Troja, Tiryns, Mykenä, Orchomenos, Ithaka im Lichte der heutigen Wissenschaft. Leipzig. 1890.

Note. 18. Stone blocks on the tower are 3.28 ft. high and up

13.1 ft. long; others are 5.58 ft. in length.

The assumption that the water channels were likewise set with clay mortar is evidently to be rejected.[19]

Note 19. See Schuchhardt. p. 40.

29. On the northwest slope of the hill of Mycenae have been found passages in the walls, like those at Tiryns, and which are covered by ashlars corbelled out. Others are horizontally covered, so that in some places, the horizontal covering alternates with a polygonal one. In connection with these, a similarly constructed passage 4.26 ft. wide leads down about 50 steps to a cistern. The very rough and irregularly dressed walls and ceiling are here covered by a coat of white-gray s stucco 1.18 ins. thick, which follows the rough surface of the ashlars. The appearance recalls that of certain grottos of the late Renaissance, where the rock-work is made of stucco and cement mortar.

We may well assume in Tiryns a similar coating on the surfaces of walls and ceilings of similar passages in the walls. The use of these passages for storing provisions and for occupation by men and animals, thus becomes more probable.

The ground plan of the Palace is explained by the discovers, Schliemann and Dörpfeld, as follows, and this explanation may be less readily attacked, since the statements agree with the reality in all points, of which a control of place and location convinces us.

Note 20. Fig. 20 is a facsimile reproduction from Cent. d. Bauverw. 1886. p. 91.

"As shown by a glance at the plan (Fig. 20), the fortifications of the upper city exhibit great differences in strength and form. The most remarkable parts here comprise the south wall and the southern half of the east wall, especially since we have been informed of the plan of the frequently described
30. so-called "galleries". The walls here, especially in their lower portions, are penetrated by long narrow passages e, adjoining which are externally a number of rooms f. These internal passages, as well as the stairways leading down to them, were all covered by means of corbelled-out courses of stone, and were probably once lighted by openings like loopholes, as may still be recognized in the passage on the south side. What the purpose of the arrangement described may have been, cannot

be stated with complete certainty; yet the author of the work on Tiryns properly refers to entirely similar designs within the enclosing walls of Carthage, which we know from Appian (Hist. Roman. I. Bekker. 1842. p. 220, 1-8) served as stables, as well as for occupation by men, provisions and war material. It appears questionable, how the now destroyed upper portions of the walls were constructed, and among other points, whether the plan of the lower casemates was repeated there, as in Carthage. To the inner side of the upper walls, and especially at the level of the pavement of the entrance street or of the fore-court, porticos appear to have been attached.

In the southwest angle of the Citadel and on a natural projection of the rock is found a massive tower with two internal rooms, whose purpose remains uncertain, and further northward is an entrance stairway to the Citadel, protected by a separate external work, and by means of which a person coming from the sea would first pass up to the middle terrace of the Citadel, and then by another stairway to the passage adjoining the men's hall of the Palace. Two other side entrances, which perhaps had the twofold purpose of serving as entrances and sally-ports, are found in the lower Citadel; whether a similar one also once existed at the now destroyed southwest angle is no longer to be recognized. The principal gateway b could be used for chariots and horses, and turned away from the sea, lies at the middle of the eastern longer side, and is accessible by a ramp 15.4 ft. wide, which ascends beside the wall. Within the gateway, the way divides to the lower citadel, to the middle terrace, and on the left to the upper citadel. The way to the lower citadel leads through a narrow alley between the eastern wall and the Palace itself, first through an inner barrier gate c, and thence by a separate ascent upwards to the southwest angle of the citadel, from which by a sharp turn to the right, one passes into the outer propyleion i before the courtyard of the citadel. This propyleion represents in its plan with external and internal porticos andt the true gateway wall between them, the simplest form of the model for the designs of gateways later treated by Grecian art in such different ways. The base of the walls in rubble stone, the stone thresholds with holes for wooden door jambs, and the circular plinths of the columns, are still preserved. From the inner portico of the propyleion, we can go

through a narrow passage directly to the courts before the women's dwelling, and passing straight forward from thence, enter the great court. This is the fore-court of the Palace, entered through a gateway k, similar to the preceding, but considerably smaller; one first enters a court about 3380 sq. ft. in area, surrounded by porticos. Just on the right of the entrance through the gateway have been found the remains of an altar with a sacrificial pit. This was perhaps an altar of Zeus Herkeios, sometimes mentioned by Homer as found in the aule. The pavement of the court is almost entirely preserved and consists of a coating of lime,and the water is removed by a drain at the northwest angle. Opposite the altar and looking towards the south, lies the chief apartment of the Palace,[53] the men's apartment m (megaron), a rectangle 38.7 by 32.2 ft., characterized alike by its size as well as by its preferred location on the highest point of the rock of the citadel, and accessible from the court through a portico and a separate vestibule. Four columns supported the ceiling of the hall, at whose centre, in conformity to the statements of Homer, is found a circular structure, probably the hearth.

The dwelling of the women is on the east of the men's apartments, but is not in direct connection with them. It exhibits a plan corresponding to that of the men's dwelling, though simpler; first a court, then a portico, from which one passes directly into the hall, and by side doors into the adjoining passages. The women's apartment has an area of about 462 sq. ft.; a hearth appears to have existed at its centre, just as in the men's hall. The floor consists of a coating of lime. In the southwest angle, remains of the ancient stucco on the wall with painted decorations have been found in place.

The purpose of the numerous other apartments of the Palace is not so assured as that of those mentioned. A series of rooms accessible by passages and vestibules lies in the northeast angle; in these should be recognized the sleeping apartments, and also perhaps the armory and treasury of the ruler. Two narrow adjoining rooms on the north side of the court, according to Dörpfeld's conjecture, contained the stairway to the roof, or to a possible upper story. From the court before the women's hall, one passes further southward to a third court. This, with all

31. adjoining apartments, may have served for housekeeping purposes, and the rooms lying next the front gateway for the quarters of the guard and watch at the gateway.- Another and in part badly ruined group of apartments adjoins the men's hall and its court on the west. Only one room of these may be determined with certainty, the bath-room o, whose floor consists of a single enormous slab of stone 9.84 ft. wide, 13.2 long and 2.3 in thickness, with a total weight of about 44,000 lbs. On the raised margin of the stone, which has a channel for carrying off the water, are regularly spaced holes for dowells, according to Dörpfeld's conjecture, for fixing a wainscoting of wooden planks. Fragments of a great bath-tub[54] of clay have been found, which stood in this room. The location of the bath-room in the vicinity of the men's court and in convenient connection with the megaron certainly agrees with the ancient custom, also mentioned by Homer, of first affording the refreshment of the bath in part to the coming stranger, before he was received at the hospitable hearth.

The lines of the walls of quarried stone rise but little above the ground; we frequently find only thresholds and vestiges of location; in other places, we still see on the external surfaces the clay coating up to 3.15 ins. thick, covered by neatly smoothed lime plaster, partly with painted decorations. The few remains of building stones (quarried) makes it probable that the superstructure was built of wood and unburnt bricks.[21] To design a representation of the appearance of this structure must be left to the reader and his imigination.

Note 21. In the mode of building still common today in the Peloponnessus, and especially in the vicinity of Tiryns, with unburnt bricks and wooden anchors, the enclosing masonry usually stands on a course of quarried stones, to protect the perishable material from wet and from the dampness of the ground.

The painted stucco on the walls with its rosettes and spiral forms (see colored plate opposite p. 31) and other ornamentation indicate Egyptian art, and to the same source is likewise to be referred the decoration of a frieze pattern by inlaid slips and beads of blue glass (koanos)[22] But with these also occur primitive ornamental forms peculiar to the country; the heart-leaf, the ivy leaf, and the so-called wave ornament. The latter may

indeed be native among all peoples in all parts of the world inhabiting the shores of the sea, as has been shown.

26. , Royal Palace in Mycenae.

The excavations undertaken in Mycenae in 1886 by the Greek Archaeological Society under the supervision of Tsountas brought to light a second royal palace with a plan similar to that at Tiryns. The apartment of the one palace designated as the megaron is repeated in approximately the same dimensions, with its arrangement of portico, vestibule, of men's hall with the four mark's of the location of columns and the vestiges of the round hearth. These objects, as well as the existence of a threshold of breccia with four holes for the jambs and the limestone floor slabs of the vestibule, injured by fire, we have ourselves examined.

The remains are shown by the corresponding plan of the Citadel,[23] on which may be recognized the location of the court, of some subordinate apartments, and the stairway (20 well preserved steps) As at Tiryns, the plan of the building is only determined by a few courses of stone projecting above the ground.[24]

Note 22. Also see Heydemann. Schliemann's Ausgrabungen in Tiryns. Zeit. f. Bild. Kunst. 1886. p 125.

Note 23. See Schuchhardt. pp. 319-329 .nd Pl. 5.

Note 24. Under these conditions, a fatal impression is made on those acquainted with the site of the building, and a misleading one on the reader, only deciding in accordance with the report, since in the illustrations things are represented as existing, which are actually no longer preserved. Schuchhardt, for example, describes (pp 321-324) wooden beams "as in the walls of Troy", - "the roof supported by four wooden columns", - and "what is true for the plan (referring to Mycenae) is likewise true for the superstructure; everywhere the most striking agreement with the Palace in Tiryns. Floors, doorways, posts, thresholds, roof, everything is exactly as there."-- But there is nothing left of the columns, doorways or roof, as we have stated, and there are also no longer any beams in Troy! Now if it even be stated (p. 324), that the mural paintings are richer in one place than in the other, rather too much is still demanded of the reader.

32. The civilization at Mycenae and Tiryns is now generally referred back to the middle of the second thousand years before our era (entire absence of iron articles in the finds leads to this

opinion), and thus the fixing of the destruction of the palaces there at the time of the Doric immigration (1100 B.C.) may be accepted as correct.

27. Royal Palace in Troy.

The excavations in the mound of ruins of Hissarlik (Fig. 21) have brought to light an enclosure of fortifications of small extent (one-third as large as those at Tiryns), defended by strong gateways and narrow towers and enclosing fragments of different buildings. Schliemann recognizes in them the fortress of Priam, the citadel and palace of the ruler of the Troy of Homer, and his opinion is shared at this time by influential savants.[25]

Note 25. For the different views, see the writings of Bötticher, especially: Hissarlik, wie es ist. Fünftes Sendschrieben über Schliemann's Troja. Berlin. 1890. Also Kunstchronik z. Zeit. f. Bild. Kunst. 1890. pp 242-254. Further, Schliemann. Ilios. Lastly, Durm. Zum Kampf um Troja. Berlin. 1890.

A striking description is certainly given by Bötticher in his statement:- "One betakes himself to the remaining outer portion of the mound of rubbish, from which he looks down, as if into a crater. The best place is above the so-called southwest gate. He sees a polygonal terrace, which is Schliemann's Acropolis of Troy! The terrace consists of rubbish criscrossed by walls down to the original surface of the ground."

We give in Fig. 22 a view from our own sketch on the ground, and also the ground plans of Dörpfeld in Figs. 23 and 24 for further information, and from these it appears that a ramp covered by great polygonal slabs of white stone leads up to the so-called southwest gate, which by its design recalls Etruscan city gates. Within the enclosing walls are first two parallel rectangular rooms, separated from each other by a narrow intervening room, enclosed by unburnt bricks and subdivided in depth by cross walls, which chiefly attract our attention and recall similar walled structures on the area of the Citadels of Tiryns and of Mycenae, where they are recognized as the apartments of the men and the women. The same applies to the superstructure, that has been said in reference to the two palaces in the Argo-
33. lis already mentioned. Perhaps the representations on the Francois vase afford some commencing points for a reconstruction, though the temple and fountain-house represented thereon do not

exhibit gable roofs, but rather straw and clay roofs of slightly cylindrical curvature. Singularly similar are the widths of the rooms A and B of the plan to those corresponding in Tiryns.

28. Palace of Odysseus.

No perceptible fragments of the much besung Palace of Odysseus have been discovered, since the investigations so far made on Ithaca by Schliemann and others[26] have essentially been of a topographical nature; but the remains of an ancient palace near the Erectheion were found since 1887 within the cyclopean enclosing walls of the Acropolis of Athens. (See plan of the Acropolis in Deltion archaiologikon. 1889).

Note 26. See Schuchhardt. p 341).

"Room succeeds room, and its fore-court is well enclosed by walls and battlements; a gate of two leaves closes strongly; in truth, hardly may a man conquer it."

Thus is the "home" of Odysseus described. The hill of the dung of mules and of cattle before the gate of the court betrays the agricultural pursuits of the owner; the weapons in the men's hall, where fir beams and lofty columns were blackened by the smoke of the open fire and of pine-wood torches, indicate on the other hand the warlike spirit of the master. Stables for draft animals, wagons, and beasts for slaughter, mill and bakery, another court surrounded by porticos, beneath whose protecting roofs strangers reposed, and in whose midst stood an
34 altar of Zeus, a women's hall with columns and adjoining apartments in two stories, are all well arranged together in the citadel.

Purple coverings lie on the seats inlaid with silver and ivory; tables and stools, covered by sheepskins, fill the rooms; doors separate the apartments; they are lighted by golden lamps. Thus walls for defense and offense surround the master's seat; agriculture, hunting, war, and an occasional raid for booty occupy the master, while house industries busy the wife, and a crowd of serving men and maids help in everything. A display of magnificent vessels, beautiful fabrics, women's handiwork, embroideries and woven fabrics is made on occasion; in a large hall for drinking and weapons, the men assemble.

Note 27. Fig. 23 is a facsimile reproduction from Cent. d. Bauverw. 1890. p 424. Also see Zeit. f. Bild. kunst.; Kunst-

Chronik. 1890. p. 846. Further: Schuchardt; also Schliemann. Troja. Leipzig. 1884. Pl. 7. Lastly, Schliemann. Bericht über Ausgrabungen in Troja im Jahre 1890, etc. Leipzig. 1891. Especially Plate 3.

28. Domed Tombs.

As the palaces are placed before us, they belong to the same series as the great memorial monuments of the Grecian prehistoric period, the Tholos at Orchomenos and the domed tombs at Mycenae. Architectural creations of the last kind are to be regarded as the climax of a preceding development, whose precursors are to be sought in Asia Minor (Phrygia and Lycia). The Lycian pointed-arched roof reappears in the vaulting; the Ly-
35 cian rock-cut tomb is the ancient dwelling translated into stone,
36, in which, according to the belief of the ancient peoples,[28] the
37 souls of the deceased again prolonged their existence. But
the Lycian house appears as a structure with a rectangular plan, while Vitruvius specifies the circular form for the inhabitants of the Phrygian valleys, constructed of timbers set in conical form with a covering of brush and earth. We should then have before us in these domed tombs the ancient Phrygian huts of brush and earth, translated into stone.

Note 28. See page 65 of the next volume of this Handbook.

The similar primitive model is also found in the structures of the New World, and especially in the Navajo huts near Pueblo.[29] The possibility of the existence of such dwellings is therefore no delusion, and Vitruvius is right, as well as Adler, after him.

Note 29. See Powell. Peru. Bureau of Ethnology. Washington. 1886.

On the way to the gate of the Citadel in Mycenae, we find large subterranean apartments on the slope of the citadel, constructed of quarried stones, and really the chambers mentioned by Pausanias, in which "it is said, Atreus and his children concealed their treasures, the Tomb of Atreus, and the Tombs of all their" ---. It is not quite clear from the quotation, whether Pausanias placed the Tomb of Atreus in the Treasury. The tomb and treasury were frequently combined or were of equal importance; his treasures were placed with the deceased. Compare Schliemann's rich find of golden objects in the five tombs at

the Lions' Gate and others. Plutarch states that Philopoemen was interred in the Treasury at Mycenae. But since a similar plan with six undistubbed bodies and all their ornaments has been discovered in Menidi near Athens, its purpose is no longer doubtful.

An excavation in the hill, a passage-way somewhat more than 19.68 ft. wide and bordered by high and regularly coursed ashlar walls, leads to the entrance doorway of the large Treasury (Fig. 25); the passage-way, walls and interior, are now freed from all rubbish, the solid rock being visible as the floor of both rooms. The visitor enters a circular structure about 49.21 ft. in diameter and height, built of carefully wrought ashlars of hard breccia and covered by a kind of pointed dome (Fig. 26); stones are broken out near the keystone, and the sunlight enters there and illumines the interior, which possesses an appearance of considerable extent. An abundant light also enters th through the doorway, now closed by an iron grille. The vaulted surfaces of the walls are formed by corbelling out the separate ashlars, while the circular flat keystone has a tapering form. Omitting this, I counted 33 courses above the floor, which are
38 laid on each other without mortar. The end joints are only correctly dressed radially for a short distance, the remainder being left as quarried, and the interspaces are filled with stone sp spalls; the entire course is backed with dry masonry of large and small blocks, then being covered with earth. Excepting in the four lowest courses, each ashlar shows two drilled holes; remains of bronze nails are in many, so that a covering of metallic plates may with certainty be assumed to have covered the interior, and which may have consisted of separate zones of ornamental or figure representations, or of separate ornaments, for example, rosettes.[30] The clear width of the doorway diminishes about 6 ins. upwards (Fig. 27); the jambs are formed in the ashlars of the wall and have double reveals, like the lintel, and bear numerous marks of fastenings, holes and pins, and the surfaces of the reveals show the scratches of the saw-blade; the lintel of the doorway consists of two enormous blocks, each 27.89 ft. long and 3.67 ft. high, and it is relieved by corbelling out the ashlars above it, as at the Gate of Lions. The resulting triangular opening is the masonry is without sculptured decoration and is now completely open. The well-known small

39. fragments of a capital (Fig. 28) with zigzag ornaments and of a half column, found near the entrance of the Treasury some years since, with pieces of red, green, and white slabs of marble with reliefs, and the holes in the stones of the jambs and lintel, supply a basis for the assumption that the exterior was completely decorated.

Note 30. According to the latest researches of Dörpfeld, large holes are made by two holes drilled beside each other above the 3 d, 4 th and 5 th courses, close to the joints, at distances of 3.44 to 4.00 ft. Small holes exist in the middle of the 5 th and between the 6 th and 7 th to the 17 th course at horizontal distances of about 2.63 ft. apart. Nothing higher up is to be clearly seen.

It is not impossible that a veneering of marble concealed the entire walls of the passage, that half columns gave a richer appearance to the architecture of the doorway, that a figure relief filled the triangular space above the portal, that color and metallic ornamentation gave to the whole an entirely different appearance, recalling the treatment of certain Pelasgian tombs, and that we have in its present form merely the rough stone nucleus of a once magnificent structure, Asiatic in style.

This assumption agrees well with the wealth and treasures surrounding the ruling race under ordinary conditions.[31]

Note 31. The attempt at a restoration made in Pl. 5 in the Antiquities of Athens etc., measured and described by Cockerell, Kinnard, Donaldson, Jenkins, and Railton, does not require mention. Like most productions of the imagination, the conviction is assured that it could not have been so!

Further excavations revealed the stone blocks on which stood the half columns at the sides of the portal, whose dimensions of 1.97 by 1.12 ft. were recently measured by me, agreeing with the representations in the account of the discovery.[32] The decorated fragments previously found and designated as bases could not be placed on them. because considerably larger. This fact and also the place for the architrave made on the abacus (formerly the plinth) as well as various arrangements for fastenings on the portal and on the fragments, sufficiently prove that we here actually have to do with the fragments of a capital, which together compose a form of capital similar to that

on the column of the Gate of the Lions.

Note 32. See Thiersch. Die Tholos des Atreus zu Mykenä. Mitt. d. Kais. Deutsch. Arch. Inst. Athens. 1879. pp. 177-182, Pls. 11-13.(Used for Figs. 26 and 27).

Fig. 27 gives a representation of the arrangements for the fastening and of the portal in general. The shafts of the columns must have here extended only to the fastening in the 3 d course from the ground, a condition similar to that preserved at the Gate of Lions, and which, with its very moderate diminution downwards, appears acceptable. A separately treated pedestal must have formed the foundation between the 3 d course and the ground stones (supporting blocks), indeed in the same form as on the Gate of Lions.

Besides the discovery of the bases, four more fragments of the capitals were found, in addition to those known and dispersed,[33] one of which we reproduce from the original piece in Fig. 28.

Note 33. Now in the Grand Ducal Collection at Carlsruhe.

40. In Athens is now a triangular slab of red porphyry decorated by two horizontal series of wave scrolls, whose points fit accurately in those of the enclosing triangle; also of the same material, a slab 2.89 by 1.38 ft. with 3 rows of similar ornaments, and two fragments of slabs with fan-like decorations on the narrow sides. Also a fragment of the shaft of a half column of greenish stone, like the capitals, a larger number of inlaid pieces with ornaments of white stone, and a fragment of a slab of bluish-gray stone with wave ornaments, other fragments are to be found in London and Munich. The holes for the cramps on the side next the entrance and the marks of cramps on the inlaid pieces prove the veneering of the part of the wall above the lintel of the doorway, and the pins and pin holes of the fascias of the opening for the door, the veneering of the door frame.

Notwithstanding this material, a satisfactory restoration of the exterior has not yet become possible. But the great tholos did not serve as a sepulchre; this was rather a small adjoining rectangular room, connected with the preceding one by a doorway, whose lintel was relieved from its load, like that of the main portal (Fig. 29). The room is now without decoration, roughly cut in the rock, but must have formerly possessed ornamentation on walls and ceiling.

Not far from the Gate of the Lions is a second and smaller wholly structural Treasury of only 34.46 ft. lower diameter. The upper portion of the apartment has fallen in; the blocks lie on the floor and permit the jointing and dressing of the separate ashlars to be accurately recognized; vestiges of a former bronze covering of the interior are not preserved. Schliemann found a fluted half column[34] about 4.10 ft. high and 1.31 ft. diameter near the entrance (the entire passage way has not yet been cleared), while the door has a clear height of 18.04 ft. In the rubbish lie fragments, 0.66 to 0.75 ft. in length, of a decorated frieze of blue and white marble. From these finds of the remains of ornamentation, insufficient as at the Treasury of Atreus, we may conclude the external decoration to have been similar to that previously described. An additional chamber does not exist, like that at the great Treasury; the triangle over the lintel is also without decoration. Fig. 29 gives a representation of the coursing of the ashlars of the vault and of their size.

Note 34. According to scratches on the wall, the shaft increased in diameter slightly upwards. The slabs above the columns bear disk ornaments, as at the Gate of Lions.

4/. Other domed tombs, four in number, lie on the western and northwestern slope of the hill of the city, and whose vaults have likewise fallen. A fifth, therefore making seven in all, was also found in the vicinity of the common burial place of the city.

Besides these, five other domed tombs have become known in Greece; near Menidi, at Orchomenos and Pharis near Amyclea, near the Heraion south of Mycenae, and near Vols in Thessaly.

30. Domed Tomb in Orchomenos.

Pausanias mentions the Treasury of Minyas at Orchomenos, i. e., a domed tomb there, as a remarkable work. "it is a circular structure, somewhat depressed-pointed at its apex; the topmost stone is said to hold the entire structure together", which was not exactly the case. Also placed at the foot of a hill, like the Tholos of Atreus, this wonderful domed tomb of antiquity, the Tholos in Orchomenos, is now half destroyed. It consisted of a large circular apartment, the dromos, and an adjoining rectangular chamber, which was built of green slate,

whose quarry has been located in the vicinity of Lebadeia. The dimensions of the entrance doorway were almost exactly the same as in Mycenae, and the diameter of the domed interior is only 3.28 ft. less than there. Eight courses above the floor and entirely preserved, and 12 are partially so. Above the 5 th course, almost every other stone shows preparations for fastening metallic decorations, which also extend over the architraves of the small sepulchral chamber.

Note 35. Fig. 30 is a facsimile reproduction from Schuchhardt, Plate opposite p. 340.

The holes and bronze pins there form a continuous system of five points at which bronze rosettes may have been fixed.

The chamber was sunk downwards into the rock like a shaft; the walls were covered by masonry, and the ceiling was composed of slate slabs 0.98 ft. thick resting thereon, which were decorated by a sculptured spiral pattern enclosed by a border of rosettes, and by an inserted central panel (Fig. 30). But the walls were covered by marble slabs similarly ornamented, whose decorations and those of the ceiling slabs were borrowed from tapestry work, and are nearly identical with those of Egyptian paintings on ceilings.

31. Domed Tomb near Menidi.

The domed tomb discovered near Menidi[36] is built of courses of quarried limestone blocks, which are irregular, only being roughly dressed with the hammer, and are set on each other without mortar, but well chinked with spalls. The diameter of the Tholos is 27.5 ft. with an original height of 29.5 ft. But the entrance doorway is constructed of more carefully dressed stones of larger dimensions, and a peculiar mode of relieving the lintel was attempted by anchoring together the obliquely inclined walls by bond-stones (Fig. 31), and this is to be considered. A dromos 9.85 ft. wide and 91.0 ft. long leads to the entrance doorway, just as for the Tholos of Mycenae.

Note 36. See Lolling, Bohn, Furtwangler, and Köhler. Das Kuppelgrab bei Menidi. Pub. by Kais. Deutsch. Arch. Inst. in Athens. Athens. 1880. Tech. Theil. pp. 45-47, pls. 1, 2.

32. Domed Tomb near Dimini.

The same construction is shown by the domed tomb near Dimini[37], located one hour from Volo. A circular stone slab here serves as

the keystone of the tholos, and is 4.72 ins. thick and 3.67 ft. in diameter. The height of the domed chamber is 29.5 ft. , its lower diameter is 27.9 ft., and the height of the entrance doorway is 11.8 ft. The agreement in the ratios of the domed tombs described is striking.

Note 37. See Mitt. d. Kais. Deutsch. Arch. Inst. Athens. 1886. pp. 435-443; 1887. pp. 136-138.

33. Tumuluses.

Homer speaks of another kind of sepulchral monuments for his heroes; these are colossal mounds of earth, frequently on a stone substructure and intersected by dividing walls, the Tumulus, such as still exists at Sardes on the Sea of Gyges, and on the hill terrace of ancient Smyrna and in other places, as memorials visible at a great distance.

"But they mass the monument in a circle, lay the stone base around the fire, and heap the shot earth up into a hill".

Hector's bones were placed in a golden box in the hollow grave beneath the stone cairn and covered by the pile of earth. 43. Patroclus' white bones were collected from the funeral pyre, placed in a golden urn between two layers of fat, and the mound was then thrown up; to Elpenor, "we heaped up a tomb, placed on its top a pillar, then fastened on high the finely polished oar".

Telemachus also thought of piling up a memorial to his father on rocky Ithaca.

Another form of sepulchre of the heroic period was discovered by Schliemann near the walls of the citadel in the vicinity of the Gate of Lions at Mycenae, the so-called pit tombs. The narrow surface of the rock between the cyclopean walls of the first and second enclosures of the citadel, which is steeply inclined, was covered with earth, leveled, and supported a double series of vertical stone slabs set in a circle and of horizontal uncovered stone slabs. This ring of stones is about 88.58 ft. in diameter, with a narrow entrance on the north; at its centre stood a series of sepulchral slabs, some of which are decorated by reliefs (4 sculptured and 5 not sculptured were found, with a great many fragments of others). Beneath them and deep beneath the layer of earth were 5 sepulchral chambers of oblong form and cut in the solid rock, to which a sixth was la-

ter added, their average length and breadth being 19.69 and 9.84 ft. Within these were the skeletons of 12 men, 3 women and 2 children, lying on pebbles, among which numerous remains of food were to be found, and covered by a layer of clay, pebbles and earth.

The walls of the tombs were lined with small quarried stones and they were covered by slabs of shell limestone, which rested on wooden beams, whose ends were covered and protected by shells of sheet copper. The edges of the shells were hammered together and fastened to the wood by means of copper nails.

Crowns and diadems of gold with stamped ornamentation lay on their heads, and golden masks covered the faces; golden shoulder belts, bronze swords with golden handles and inlaid work, rings, golden vessels, silver cups, head-bands, golden ornaments for greaves, beautiful wooden buttons overlaid with gold plate, bracelets, idols, copper kettles made of plates riveted together, ornaments of rock crystal and amber, an alabaster vase, an ostrich egg with overlaid dolphins, Egyptian porcelain, etc., were near the dead, these objects now filling an entire hall of the Polytechnic School on Patissia St., Athens, really one of the most interesting collections in the world. The ostrich egg and the porcelain indicate very ancient commercial relations between the inhabitants of the Argolic plains and Egypt; the golden masks point to Asiatic as well as Egyptian customs. The latter have already been found in Babylon (now in London), in Memphis (now in Paris), on the coasts of ancient Phoenicia, opposite the island of Aradus at Byblos, the city of the stone-cutting Giblites, the supporters of the great Phoenician ashlar style, the city of Zenobia on the Euphrates, in Kertch, in Olbia, and a bronze mask at Nola.

On these ornamental objects, the Phrygian style of decoration plays an important part, and all elements of assuredly Mycenian pieces of ornamentation are shown in Asia Minor.[38]

Note 38. See Milchhöfer.

§.35. Pyramids.

Here should also be mentiined the ruins of the Pyramid of Cenchrea,[39] which is built of great polygonal blocks, partly with the use of mortar (the latter perhaps to be referred to a mediaeval restoration ?). The plan forms a rectangle of about 49.2 ft.

long and 39.4 ft. wide; three sides are well preserved to a height of about 9.84 ft., while the fourth (western side) is greatly injured; at the eastern side is an entrance, through which one enters a narrow passage and from this the true internal chamber, about 62.3 sq. ft. in area, which was originally 39-divided into two rooms. Whether this almost unique building in Greece was a sepulchral and victory monument (the so-called polyandrion) or a wathctower, or the like, is yet in dispute.

Note 39. See Lolling in Baedeker's Greece. Handbook for Travelers. Leipzig. 2 d Am. edition.

36. Cities and Dwellings.

The wealthy city of Corinth, well built by the high minded Erechtheius, has now disappeared, together with the beautifully built Cleona, the strongly walled Tiryns, and Mycenae, the city filled with distinguished houses; only scanty vestiges now mark the dwellings of the citizens in the cities of which Homer sung. a poor piece of well jointed ashlar masonry from which gushes a water course, and an overhanging figtree in an elevated, grand, and peaceful country, mark the location of Cleona; the lower city of Corinth has been swept from the earth by war and earthquakes. Many vestiges of the city walls of Mycenae have been recognized, though but extremely slight, and these show that but a portion of the lower city was surrounded by weak enclosing walls, while the greater portion was terraced and adjoined the higher fortified city as a solidly built suburb, to which the inhabitants retreated in case of attack, with their wives, children, and property. The principle of a fortified higher and an unfortified lower city was almost generally adopted, and it was retained with modifications until the later period.

On the western, southwestern, and southern slopes of the rock of the citadel are still pointed out numerous ruins of cyclopean structures, some with considerable dimensions (88.58 and 59.05 ft), the sites of former dwellings, and also perhaps of public buildings and sanctuaries, mixed with the remains of cyclopean retaining walls. The houses were mostly simple and treated without decoration, placed on a firm substructure of ashlars, and were built of burned, of frequently of merely sun-dried bricks, as still customary in the Argolic plains. The plan and subdivision of the private houses of the heroic period is unfor-

tunately lost to us; they must have always been quite simple, since about 514 B. C., even the city of Athens was described as close, dirty, and uncomely. The house of a Themistocles or of a Miltiades was small and modest;- but there must have been a great many more requisites wanting 600 years earlier.

We likewise know in reference to other cities, that they were not compactly built; thus Sparta consisted of 5 districts without walls, "not distinguished by temples and costly structures, but composed of several villages, in accordance with the ancient Grecian manner of building cities".(Thucydides). The houses were rudely constructed; according to the laws of Lycurgus (880 B.C.), no tools other than the axe and the saw could be used in the fabrication of ceilings and doors. Two kings, Leotochides and Agesilaos, though certainly not without a sneer, could ask about 480 and 380 B.C., whether trees grew square in that country, when they saw the carefully carved wood-work in the house of a foreign host.

37. Most ancient Religious Monuments.

Few are the vestiges of monumental places for the worship of the Deity or of religious monuments during the heroic period (Altar of Zeus Herkeios in the court of Tiryns and on the Acropolis of Athens), or during the first century thereafter.

45. "The nameless and impersonal deity of antiquity" reqsired no house; the worship was seldom a common one of a united people, and neither now nor during the best derica, after the creation of entirely personal deities, was this worship performed within closed rooms.

Trees, rocks, fountains, etc., were symbols of the deity, or sacred places to which men reverently drew near. The later deity became personal later and was first revered in formless images, which were placed beneath the open sky, in caves or sacred trees, al all times being accessible to believers for prayer and comfort of soul. An image of the deity, still lacking art, an uncut stone in accordance with ancient custom, is Pausanias' description of the idol later placed in the Temple of Hercules at Hyettus. The very ancient image of Eros at Thespia consisted of an uncut stone, and the highly venerated Charites in the Orchomenos are rough fragments of stone fallen from heaven for Eteocles. The image of Artemis Kedreatis at the same place stands i

at the same place stands in a great cedar, and the ancient image of the Ephesian Artemis is in the hollowed trunk of an elm. In Sparta, two beams connected by transverse pieces of wood represent the Dioscures, and a phallus on the hills of Cyllene represents Hermes; the image of the deity at Amyclea is "old, without art and like a bronze column".-- Such idols of perishable materials required protection from wind and weather and exhibition under cover, as seen in case of the images of Artemis; a canopy-like protecting roof supported by columns, the simplest and most natural arrangement affords this protection. The ancient sacred wooden pillar of Oenomaos was protected by a roof borne by 4 columns; the roof supported by wooden columns, or the Sanctuary without walls on the market-place of Elis, the prototype of the later columnar temple, actually served for similar purposes. An increased protection was afforded to the sanctuary and the gifts by enclosing the place of exhibition by walls, or the cella of masonry, which received its light through the great doorway. To develop these architectural ideas and to express them in monumental form was postponed until the succeeding period.

38. Development.

After the Trojan War, many changes of habitation and settlement occurred in Greece, so that the country could not develop itself peacefully and prosperously.

The long absence of the princes and the warriors from their domestic hearths during the Trojan War afforded fine opportunities to ambitious men remaining at home, for creating complications of all kinds, which required bloody solutions. Transfers of possessions, emigrations and immigrations followed the bloody drama; thus in the "eightieth year" after the fall of Troy, the Dorians united with the Heraclides and took peaceful possession of the Peloponessus.

The more numerous changes occurred in the inhabitants of the most fruitful portions of the country, in Thessaly, Boetia, and a part of the Peloponessus, Greece only painfully attaining to peaceful and orderly conditions, which were first enjoyed by Attica, in particular. On account of its sterile soil, this region was generally from the earliest times free from commotions, and the Athenians proudly called themselves "autochthenes" or aborigenes, the most ancient people, "who alone of all the Greeks had not changed their abiding place". Thucydides sees in this one rea-

reason for the high eminence of Athens in comparison with the other states. Men of importance appear as lawgivers in the dif-
46. ferent states, arrange public affairs, and prosperity increases after more quiet conditions prevail. Fleets are built and colonies are sent forth, and in this way the Athenians peopled the Ionian territory and most of the islands, but the Peloponessians settled Italy and Sicily. (See Thucydides). The stream of the race, originally flowing in past times from east to west, turns back towards the east; Moreover, the Trojan War is already regarded as an abortive effort of civilization directed eastward.

At about this time, the names of "Hellas" and "Hellenes" may be applied to the entire native land and to the people allied by descent, as Homer lived after the Trojan War and used this as a general designation of the Danaides, Argives, and Achaians.

The Athenians were also the first people to assume a more comfortable mode of life and to give up the barbarous custom of bearing weapons, resulting from the insecurity of previous conditions. The Olympian Games were instituted 776 B.C. as an expression of the national unity; we find Grecian colonies and mercenary soldiers in Egypt in 670; about 600, Grecian colonies extended from the Black Sea to the western Mediterranean. Even the northern coast of Africa received a Grecian colony in the founding of Cyrene by Battos.

These colonies were not mere trading stations, as with the Phoenicians; they were the means of furnishing new and better abodes for the increasing population of the mother country.

The Aeolian, Ionian, and Dorian colonies in Asia Minor soon excelled the mother country in the development and fostering of the fine arts, exerting no unimportant influence upon them. The 12 cities of Miletus, Myus, Priene (in Caria), Ephesus, Colophon, Lebedos, Teos, Erythrae, Clazomena, and Phocea (in Lydia), and the island cities of Samos and Chios, attained to wealth and consequence, aroused the jealousy of the Lydian princes to whom they paid tribute, and who were otherwise not averse to the Greek race. (617 to 564 B.C.)[40] By resisting these princes, Miletus lost its Temple of Athena but received two others, built anew by Alyattes. The art-loving and wealthy Croesus gave golden cows to Ephesus as sacred gifts, together with most of the columns of the temple; he sent to Delphi 117 golden half

tiles, on each of which a golden lion was represented, a silver mixing vase and one of gold, the former containing 600 amphorae, 4 silver casks, sprinkling vessels of silver and of gold, articles of cast silver, and a golden female figure 3 ells in height, with the golden weapons dedicated to Amphiauros in the Temple of the Ismenian Apollo at Thebes (which were even seen by Herodotus), and also sent to the Spartans the gold for the statue of Apollo on the Thornax in Laconia.

Note 40. For example, Croesus had concluded with Sparta an alliance of hospitality and of arms.

After the collapse of the Lydian kingdom, the easy yoke of the Lydians was replaced by that of the Persians under Cyrus. The cities of Magnesia and Priene were ravaged by Mazares, and Phocea was taken in spite of its excellently constructed wall, composed of huge stones. Under the rule of his successor Darius occurred an insurrection of the Ionians, with the aid of Athens and projected by the Milesian Aristagoras, which laid in ruins Sardis, the seat of the satrap Artaphernes, the former capital of Croe-
47. sus, most of its houses being constructed of reeds, or of unburnt bricks with roofs of reeds. A Temple of Cybele was thereby destroyed, and this occurrence was later utilized by the Persians as a basis and justification for the destruction of Grecian temples by them. Miletus was retaken by the Persians, and the Sanctuary in Didyma with the Temple and the Oracle were sacked and burned. The Persians equipped themselves for an avenging campaign against Athens, which had meanwhile taken a magnificent course of development under the rule of the art-loving Pisastratides. The market-place was laid out, the Acropolis was adorned by magnificent buildings, and the great Temple of Zeus was commenced (538-510 B.C.). Slight differences between the Grecian states at this time did not directly obstruct the development of the arts and sciences.

Under the lead of exiled Greeks, the Persians invaded Greece in 490 B.C., laying waste the territory of Eretria, plundering and burning in retaliation for the fate of the Temple at Sardis, until they were compelled to retreat after being vanquished on the field of Marathon. Athens was saved for the time. Ten years later, Xerxes crossed the Hellespont into Europe with an imposing array, first entirely overrun Phocis, burned villages, and per-

mitted fire to be thrown into cities and temples; the wealthy Temple of Apollo at Abae was thereby destroyed, together with its treasures and gifts.

Near Panopeus the army divided in two parts, the larger marching with the king towards Athens; the other proceeded on the road to Delphi, laid in ashes the cities of Panopeus, Daulis, and Aeolida, while Delphi itself only nominally escaped by means of miracles and the action of the elements. Accompanied by thunder and lightning, a block of stone broke loose from Parnassus on the appearance of the barbarians and rolled down upon the rushing hordes, who shrieked and fled before the wrath of the deity!

Thespia and Platea were burned, the abandoned lower city of Athens was destroyed, the temples were sacked, and the Acropolis and its sanctuaries were then set on fire. "After the departure of the Persians, but little of the enclosing walls remained standing; the houses were mostly destroyed, excepting a few, that had been occupied by distinguished Persians". The day of Salamis (480) put an end to this work of destruction also; the remains of the Asiatic invasion left Grecian soil a year later, after a bloody overthrow at Platea (479). On the same day as at Salamis, the Carthaginian attack on the Grecian cities in Sicily failed; Gelon broke the power of Africa at Himera.

No abundant materials now remain to us from the architectural works of the period preceding the oldest stone temples on Grecian and Italian soil; many gaps are to be specified before the masterpieces of the 6 th century. If the discoveries in Mycenae and Tiryns, in Troy and Olympia, have even extended our knowledge of entire species of buildings of the early period, we are still not in a position to correctly state the construction and arrangement of the temples of the earliest period, in all respects. And if we base hypotheses on the trunks used as columns, the substructure, and the few remaining courses of stones of the Heraion in Olympia, whose purport extends back into the 9 th and 10 th centuries B.C., no positive representation results.

The public and private life of the Greeks may still have been simple at the time of the carnage at Platea and opposed
48. to the arrangements of the splendor-loving and wealthy Asiatics. Pausanias, the general, was amazed by the tents of his

antagonists, the couches overlaid with gold and silver, the golden mixing vases and vessels, the sacks filled with gold and silver cups, by the table of gold and silver, and all the splendor of the meal. He therefore ordered the preparation of a Laconian (Spartan) meal, called the leaders to him, and said: "Ye Greeks, I have assembled you together, since I desired to show you the indiscretion of the Median general, who led such a magnificent life, and yet came to us, to deprive us of the poverty in which we live". The simplicity of the dwellings has been previously mentioned; we should not forget here that the Greeks were a free people, jealous and suspicious to an extreme, inclined to criticism, and economical with their money. No citizen dared to make a display of his opulence, so as to wound the democratic spirit by visibly luxury, which would at best have produced envy and malevolent suspicions. Alcibiades was the first to have the interior of his house painted.

The treasures and slaves of Egyptian and Persian kings were not at the disposal of the Greeks; they had no servile populace for the construction of their works, they sought to attain superiority by means of beauty and choice of form, which must be concede to their art works. Thus they avoided in their buildings a multitude of architectural motives, an overloading with ornament, and an accumulation of surprising details; simplicity was the supreme law in the temples, the public buildings, and in the dwellings. The workmen were proud of their works and viewed them with self-consciousness. To these conditions, which certainly sometimes extended beyond endurance, is due the faultless execution of most Grecian works.[41]

Note 41. See Viollet-le-Duc. Histoire de la Habitation Humaine. Paris. 1875. Also in English.

Religious sentiment and faith were firmly rooted in the people before and during the best period, although the cultured rulers could with greater freedom consider the deities as being affected by all the deficiencies and preferences of the national character of the Greeks. The faith of the people in the deity and a consideration of this made it possible for the Pisastratides, for example, to execute their designs in Athens. "A woman of the Paean district, almost 4 ells in height and of mag-

nificent development" and sheathed in complete armor, was placed in a chariot followed by the Pisastratides and their adherents; heralds cried out that this was Pallas Athene, whom Pisastratus was bringing back into the city; the people believed, worshipped her, -- the plot succeeded.

The Greeks exercised great care in the service of the deities; it was therefore strictly prescribed that the sanctuary should not be desecrated. Intercourse with women within the sanctuaries, or to visit them when not purified, was not permitted. Egyptians and Greeks were governed by similar laws in this respect, while almost all other nations of the world then known, permitted to men within the temples of the gods and in the sacred enclosures the same freedom as to animals.[42]

Note 42. See Herodotus.

If the gods were considered as righteous and perfect beings, their earthly priests were somewhat pliable. By money, the de-
49 cision of the god could be determined in favor of one party. The Alcmaeonides, who fled from the Pisastratides, constructed the facade of the temple of Parian stone instead of the tufa agreed upon, in order to win the oracle to their purpose, and attained their end by the additional expenditure; even Persian gold was not disdained, and the national welfare was subordinated to gain,-- the oracle rather intimidated the Athenians than inspired them to a war for freedom. The gratitude of the king for their good service perhaps protected the Delphic priests more than the alleged and dubious miracle.

Free from the distresses caused by the barbarians, the Grecian race in the mother country and the colonies breathed again, and under the leadership of highly gifted statesmen, the arts and sciences commenced a flight never anticipated.

39. The Best Period.

The conditions continually improved, Athens became the head of the Grecian states, and it especially showed by the magnificence of the public buildings then erected, that its much discussed power and its ancient prosperity were not fabulous. The high minded Pericles, "The Olympian", assumed control of the state policy of Attica; a sufficiency of means was found, and the city was properly provided with all the requisites for a war. Therefore, he believed that he ought to employ the sur-

plus means for objects, which would the more receive eternal fame after their completion, as they would be a source of prosperity during their construction.

He thus assumed the execution of a grand design without delay and artistic plans for works employing the people for a long period. The building materials were provided, as Plutarch states, stone, metal, ivory, gold, ebony and cypress woods. The tradesmen required for their working and preparation were also found, such as carpenters, sculptors, smiths, stone-cutters, dyers, workers in gold and ivory, painters, embroiderers, as well as the laborers necessary for the conveyance and transportation of all this; pilots, sailors, and customs officers on the sea, wagoners, horse leaders, drivers, rope-makers, linen-weavers, saddlers, road-makers, and miners. Finally, to each craft was added a multitude of assistants of lower grade to almost supply the place of mere tools by manual labor. In such a locality, all these requirements, so to speak, diffused and scattered an abundant prosperity among every age and every capacity.

The works rose gradually, as magnificent in their dimensions as inimitable in their form and beauty. All masters strove to excel the work of the craftsmen by skilful execution. Still, the rapidity deserved the greatest admiration. Structures, which it might be believed could only be completed during many generations and human lives, toiling for a single end, these were all completely finished during a single administration.

From the beginning, each work equalled the models of antiquity in beauty, while it is today fresh and living in its blooming grace. Hence a kind of veil of eternal youth rests upon it, protecting the general appearance from every touch of time. It is as if these works were imbued with the breath of a perpetu-
50 al Spring, a soul that can never change! The Parthenon, erected by Iktinus and Callicrates, the Temple of the Mysteries at Eleusis, commenced by Coroebus and completed by Metagenes and Xenocles, the long walls of Callicrates, the Odeion, whose external form was an imitation of the tents of the Persian kings, and the Propyleion, built by Mnesicles, are all works of this period. The great Phidias, the friend of the "Olympians", created the golden statue of the goddess and managed the entire undertaking; these made Athens a great city, one of the great-

est and wealthiest; through this it became the school of culture for all Greece, and even for the entire world. The power and wealth of Athens served Art first of all; during the 20 years immediately preceding the Peloponessian War, the little state of Athens expended at least 8000 talents or more than $10,000,000 for works of architecture and sculpture. "But, had these sums not been spent at that time, when every element existed requisite for the production of perfect works, this moment could never have returned".

Not alone in the mother country, but in the colnies as well, pulsated a new and active art life. Sicily fostered architecture above all else during the period from the fall of the Tyrants until the second invasion of the Carthaginians. The construction of temples commenced under the Tyrants with great zeal aud was continued in accordance with the progress of art development, even larger and more beautiful structures being erected. A large part of the temples and aqueducts at Syracuse, Akragas, Selinus, and Himera, originated between 480 and 450; the oldest Temple in Selinus perhaps about 600, the latest at Egesta shortly before the invasion of the Carthaginians in 410 (if Holm be incorrect as to the possibility of its erection just previous to the destruction by Agathocles in 307). Of t these, the Temples of Olympian Zeus at Selinus and Akragas belong with the largest of ancient times; neither was ever completed, and their dimensions were only exceeded by those of the Temple of Artemis at Ephesus. "They built as if they were to live forever, and ate as if they were to die next morning---- in the most beautiful city of mortals". In the Temples at Paestum, and in the ruins of the Temple at Lokri, the Italian colonies gave magnificent proofs of their activity in art.

The vestiges in stone of a revival in the country of Asia Minor, crushed by the war, and in the islands, are less common. The national sanctuary of the Ionians, the Artemesion at Ephesus, was spared by the Persians, and only the Temple of Miletus was rebuilt after the slaughter of the Persians, as an important monument, the Temples at Sardes, Priene, Magnesia, Teos, etc., belonging to the 4 th century or later. What remains to us of all this magnificence? A considerable amount, considering the length of time elapsed from Pericles till our day, and still

too little to afford an authentic representation of an antique temple with all its peculiarities. Although the plans of individual monuments are determined by repeated measurements, and the detail forms are known by drawings of all kinds, the desired starting points in the structures themselves for certain structural arrangements are wanting, such as the ceiling of the cell and the construction of the roof of the temple. Opinions differ very greatly in reference to these arrangements and must so continue, until a fortunate accident places more tangible memorials in our hands. Whether this chance can ever occur in case of the known monuments in their present condition may be strongly doubted. Even the soil of Olympia afforded no answer in this respect to the questions relating to this topic.

51 The various attempts to restore the antique temple in its original form, or the discussion of the kinds of temples, their lighting, and the construction of the roofs and ceilings of temples, are and must remain for the most part hypotheses more or less ingenious, which may or may not be believed; none of the theories advanced can be said to be indisputable or established. Under these circumstances, the fact longest known requires no confirmation, that our knowledge of Grecian architecture is a limited one; also that the most thorough new work upon all measurements and drawings (of which quite good ones exist), and the most extended and careful researches would fill the void as little as would Structural-esthetical-historical attempts! We are indebted to numerous detailed publications in recent times for explanations of the present condition of the monuments, and which with many worthy publications also taught us to distinguish truth from fable, and to improve many defective forms of detail, academically accepted,; but these give also no information in regard to what is irrecoverably lost. But even the number of years occupied in the construction of most monuments is known to us and attested by documents, and we must also be here satisfied with approximations.

The best preserved Doric monuments are the marble Theseion and Parthenon at Athens, the so-called Concordia Temple of limestone at Akragas, which afford definite explanations in regard to the arrangement and construction of the external details of the structure and the ceiling of the porticos; the Temple of

Poseidon at Paestum, which represents the formation of the interior, the arrangement of the aisles, the small columns placed above the others, only leaving unsolved the questions of the ceiling and of the lighting. Nearly all others have been sacrificed to the power of the elements and the lust of mankind for destruction, more or less doubtful remains now alone existing. We rely upon this material during the following discussions.

40. Decline and End.

The resources and taste for monumental art were weakened by pestilence and war, by the foreign and internal commerce of the individual states, and by the fatal strife between Athens and Sparta, which continued for nearly 30 years (431 - 404) with varying fortunes, terminated by the overthrow of art-loving Athens, and which consumed the marrow of all Greece; the people, that had once performed the greatest achievements, were "loquacious and avaricious, corrupt and cowardly"; their freedom was buried on the day of Cheronea (338). In the dazzling appearance of Alexander (336 - 323), Grecian genius flamed up again and produced in Asia art works full of importance and of noble beauty, but which lack the chaste air and pure charm of the works of the era of Pericles. Under the patronage of the Tyrants (406 - 365), the arts and sciences flourished in individual localities in Sicily; the noble Timoleon (344) created orderly conditions favorable to architecture, but the people no longer possessed any firmness and fell under the rule of foreigners. The Romans firmly seated themselves in Sicily in the year 264.

In place of Athens, Alexandria became the chief seat of Grecian literature and art; under the vain and splendor-loving princes of Pergamos, who were yet imbued with a love of art (241), Grecian art lived through a revival, eloquent proofs of this being given by the finds recently deposited in the Museums of the imperial capital of Germany (best period 241 - 138). Greece came under Roman rule in 196, and the political and artistic origina-
52. ting power of the race was thereby destroyed. The art colonies, Corinth (146) and Athens (86) were taken and destroyed, and Asia Minor was declared a Roman province; (64); the art works of Greece were transferred to eternal Rome as articles of booty.

Fulvius Nobilior dragged 785 bronze and 230 marble statues out of Aetolia; Aemilius Paulus employed 250 wagons for carrying the

stolen statues and paintings in his triumphal procession; Sulla even transported individual columns from the Olympeion to Rome.

These art treasures and the Greek captives interned in Italy gave the first opportunity for the extension of the Grecian art style in foreign lands.

"Yet conquered Hellas subdued the savage victors and brought Art to Latium".

Through the favor of Hadrian in 117 to 138 A.D., Athens and the cities of Asia Minor shone with a renewed, though a transitory lustre, then falling into oblivion, to lend a purifying and renovating force to modern art after the excesses of the 17 th and 18 th centuries.

53. A. THE GRECIAN TEMPLE.

41. General Remarks.

The works of every people in the domain of architecture, sculpture and painting, possessing the greatest importance, culminate in the monument consecrated to the worship of the Deity; the artistic idea is most intellectually developed and refined in these, and the expression of form is most complete. Therefore, we must develop and study the system of Grecian architecture in them.

As already stated and will again be shown, Grecian art stands on the shoulders of oriental art (Egyptian and Asiatic). Reminiscences of the East reecho throughout the plan of the Grecian temple. Thus the most ancient temples of Sicily (4 temples in Selinus) exhibit the much elongated form of cella, longitudinally divided into three apartments, the vestibule, the holy place, and the most holy place, as in the Asiatic temples of the Deity; excepting that the most sacred place is not surrounded by additional rooms or wholly withdrawn from the view of believers. The porticos, which surrounded the courts, are now directly attached to the temple, that forms a great protecting roof supported by columns,
54. a monumental canopy, "the most ancient symbol of terrestrial and celestial supremacy", which extends uniformly over the portico, the cella, and the statue of the Deity.

The lodest temples, whose mode of construction is not stated by Pausanias, nor whether they were Doric or Ionic, were indeed not very different from the usual dwellings of men, whose good and bad peculiarities, manners and customs, hates and loves, continued with the gods, who had become personal.

The walls of these buildings were constructed in the simplest manner, and only in one end wall was placed the great entrance doorway, extending almost to the ceiling, which from this ratio of dimensions, must have had a purpose other than that of admitting visitors, for which smaller dimensions would have sufficed. (Compare the doorways of the Gothic cathedral with reference to the capacity of the interior, remembering that in this case, the sanctuary must accommodate numerous worshippers).

Besides the closed vestibule also occurs the open one. Antae then terminate the side walls, which retain their original extent; the transverse wall and its doorway are replaced by columns, the

principal entrance doorway then being placed in the division wall, which formerly enclosed the sacred place. In another change of the plan, the third division of the cella, or the most sacred place, disappears, giving place to an open rear portico. The statue of the deity retains its position in the cella enlarged in this manner; the personal deity becomes nearer to man. (Compare the "Theseion").

There was sometimes added to the temple cella, as in the Parthenon, an additional apartment accessible from the rear, and which must have served as the treasury of the state, under the guardianship of the deity. The formerly unbroken interior was then divided by colonnades placed in it, one above the other and separated by a simple architrave, i. e., the cella was divided into two narrow side aisles and a broad central aisle. The interior became in a manner two-storied, and small staircases gave access to the different divisions in the height and to the attic.(Compare Akragas). In a further state of progress, the side walls of the front and rear porticos recede, then projecting but slightly beyond the walls containing the doors; the earlier wall and doorway is replaced by antae and columns and is changed into a complete colonnade.(Compare the Parthenon). A still more important enlargement of the cella finally led to the pseudodipteral temple, to a plan like that of the Temple of Zeus in Akragas.

Neither in the most ancient monuments nor in those of the best period is the colonnade anywhere dependent on the cella; the antae do not range with the columns of the portico, nor do these range with those of the pronaos or opisthodome; the ceiling beams appertaining thereto are arranged just as independently without reference to walls or columns of stone temples.

The new idea, which is always expressed in the structure of the Grecian temple and is in opposition to its oriental kindred, is that of a sacred cella surrounded by columns with the pediment roof supported by columns and standing on an elevated substructure. The immature and rude motive of this form of temple, compared with the Grecian, is already found in one of the species of Egyptian temples differing from the usual type, as in the small Temple at Elephantine; the building then has

in plan the form of an elongated rectangle and exhibits a surrounding row of columns or piers on a slightly elevated platform, up to which a narrow flight of steps leads.

55. 56. The form of pediment facade with antae and columns, which Vitruvius prefers to consider as the most ancient type,[43] and which has its motive in the tomb facades of Asia Minor and in the Egyptian grotto tomb of Bein-Hassan, could not have alone belonged to the temple, as is shown by Semper, and is also further proved by the treasuries in Olympia, which mostly have facades with antae and columns.[44]

Note 43. We have designated this as an already more developed form. (See Fig. 22, p. 58).

Note 44. Therefore others also allow the Grecian temple to have originated from the treasury.

57. The sanctuaries of the Greeks stand in isolation on steep heights (Assos, Egina), or are surrounded by a sacred wood, are placed on a noble terraced structure, or located in the lower portion of the city (Theseion, Olympeion), or they are frequently grouped on a strictly limited area (Athens, Selinus, Olympia, Akragas); they are often placed in consecrated precincts surrounded by strong walls, access to them being obtained through magnificent portals with porticos, propyleions, and are also surrounded by protecting porticos, treasuries, gifts, etc., often affording security in troublous times to the unwarlike portion of the people and to its treasures.

The temple should produce an effect more by its form than by its masses; I here except the pilgrimage temples, the Artemesion at Ephesus, and the two gigantic structures dedicated to Zeus Olympios at Selinus and Akragas."within exalted, quietly beautiful". They are therefore usually of moderate dimensions, and the cella was almost always accessible to the people, though not intended for the assemblage of a devout multitude.

In the Temple of the birth goddess Fileithya on the Kronion hill at Olympia, any one could enter the front apartment of the double temple, though priestesses alone entered the inner one.

The Temple of Aphrodite in Sykion was only accessible to the female temple servants and to a certain maiden; all others

only beheld the goddes and prayed to her from the entrance.

In a double Temple of Asklepios there, admission to the second part was only permitted to the priests, etc.[45]

Note 45. See Paûsanias, Book 6 (Elis, 2 d part), 20, 25.

Thus, for example, the cella of a Temple at Selinus has a width of 24.93 ft. with a length of 39.04 ft.; the centre aisle of the Heraion at Olympia is 91.34 ft. long and but 12.47 ft. wide; the centre aisle of the Temple of Zeus at the same place is 94.00 ft. by 21.39 ft. In the last case, only one-third of the cella was used by the people, since the remaining two-thirds were occupied by the statue of the deity and the tables for garlands. A space for the "people" thus remained here about 21.34 by 31.17 ft., or of 667 sq. ft. in round numbers, a superficial area corresponding to that of a large living room in a modern house.

The centre aisle of the Temple measures:--

Temple on Egina, 10.73 by 12.80 ft., or 449.96 sq. ft.
Temple in Phigaleia, 14.47 by 41.99 ft, or 522.05 ,,.
Parthenon, 32.41 by 83.98 ft, or 2722.20 sq. ft.

In these cases likewise, if two-thirds is reserved for the statue of the deity and the altar, there remains for the "people at Egina and Phigaleia the small areas of 150.70 and 172. 22 sq. ft., and in the Parthenon 914.95 sq. ft., or rather more than at Olympia. "Great festal processions"could not occur in these rooms, especially if the space occupied by the numerous gifts be also deducted!

Let us therefore omit the people and the festal processions from the temple, assuming it to have been only entered by individuals, and principally by priests alone, who offered bloodless sacrifices on the smaller altars before the statue of the deity, while the burnt offering occurred on the great altar before the temple in accordance with Asiatic usage.

57, As correctly described by Vischer, the interior is therefore "a noble and richly decorated apartment for the deity, intended to be seen, the vestibule concentrating the mind of the observer on the whole before his entrance".

In accordance with the dimensions of the ground plan, the measurements of the height of the temple are unimportant. The Temple on Egina measured 34.78 ft. high to the apex of the

pediment, that in Phigaleia 35.76 ft., and the Parthenon 62.66 ft. On a repeatedly divided substructure, broad and quietly coursed, rose the cella surrounded by columns spanned by architraves, followed by the frieze and the crowning principal cornice, the structure receiving its final and expressive ornamentation by the gently inclined pediments decorated by figures. The exterior of the temple shone with rich gilding and with brilliant decorations in color, heightened by metallic accessories, in accordance with the high colors of surrounding nature.

Chapter 1. The Doric Order.

a. Form and Structure of Principal Parts.

1). Enclosing Walls.[46]

Note 46. In the following examination, some of the technical subjects are of a general nature and are just as applicable to the Ionic and Corinthian orders as to the Doric. This will be readily determined in the passages concerned.

42. Masonry.

The enclosing (protecting) walls of the temple precincts and of dwellings are generally carefully constructed of large polygonal or horizontally coursed ashlars without special ornament, or they were built in times of necessity and distress without reference to similarity of materials and jointing. Walls composed of all kinds of stone with here and there a stone entirely uncut and just as it was brought, with many columns for sepulchral monuments and even stones wrought by sculptors built into the walls, -- thus Thucydides describes the walls of Athens, hastily erected after the Persian war, and there is still to be seen in the walls of the Acropolis these hastily constructed portions, intermingled with drums of columns, triglyphs, and fragments of cornices, while the walls around the Piraeus were constructed in the most careful manner. No cementing material, neither lime nor mortar, was employed in them; the large rectangular blocks of cut stone were laid beside and upon each other, the outer ones being bound together by iron cramps and lead.
58. The rudely coursed masonry requires to be built of a considerable thickness in order to possess the necessary stability, while it was coursed in the usual way, immaterial whether horizontal or polygonal, the solidity depending on an exact fitting togeth-

er of the bed and abutting surfaces, and on a carefully bonded arrangement of medium sized ashlars in courses, the end joints not being usually vertical, but at an inclination, as also found in Egyptian ashlar masonry, which may be traced back to 1600 B. C.; yet a characteristic of the latter is the projection of individual stones into other courses, which custom was introduced into Greek masonry of the early period. In Egyptian buildings, the separate ashlars are frequently held together by double dovetail dowells of wood and also by mortar of lime and sand, 57 while besides wooden dowells, the Greeks used those of iron and cramps set in cast lead, but bronze was less frequently employed. The manner of indirectly connecting the ashlars may indeed have been brought to Greece by Egyptian colonists; the principle remains the same in both cases, excepting that the connecting material is wood in the one case, and wood and iron in the other.

The ancient walls of Assos in Asia Minor (Fig. 38), which surrounded the ancient Doric temple, are constructed of low courses of ashlars, carefully wrought on the faces and in the joints; headers and stretchers alternate in a course, so that the headers extend entirely through the wall, but the stretchers do not reach the middle of the wall and leave voids; over the entrance doorways, where the recessed lintel is to be relieved, headers are found in every third course. In other portions of the wall, which have the considerable thickness of 9.35 ft., ashlar facings are arranged on both sides with infrequent headers, but with solidly constructed bonds at angles, so that the middle third of the wall is composed of unwrought material, a mode of construction seldom found elsewhere than in Grecian masonry. This regular coursing, together with the smaller dimensions of the stones, appertains to the later period in Egypt, and always indicates an early one in Greece.

43. Gateways.

The opening of a gateway in regular masonry is usually a vertical rectangle or trapezoid, and it is also covered by a large horizontal stone lintel, while the recess for the gate is semi-octagonal, semicircular, or pointed-arched at top, although the arched form is produced by corbelling out. That the latter may be formed by two concave stones is shown in Akarnanian walls,

(Figs. 37, 39), but at another time it is composed of voussoirs. The spanning of the opening by an arch is an almost natural result in polygonal masonry. Triangular forms produced by corbelling, heads composed of horizontal offsets, or completely equilateral triangular forms of the opening for light, are also found.

5. But pointed and round arched forms of gates occur on the battlemented city walls of Nineveh[47]; arches and vaults were already found in Egypt in the time of Usertesen I (2200 B.C.). A small vaulted tomb existed in the valley of the Queens at Thebes, whose arch bore an inscription in which Amenophis I ocurred; another tomb exhibited the name of Thothmes III (1597 B.C.). The entrance to one of the Ethiopian pyramids is vaulted in the form of a depressed arch; the stones are cut as voussoirs and the joints are filled with fine cement and stone chips. Hoskins considers these pyramids to be more ancient that those in the valley of Egypt; hence the arch dates back in Egypt before 3000 B.C. The Chinese assert that they have possessed it from time immemorial.

Note 47. See Layard. Nineveh and its Remains. Vol. 2. London. 1849.

6. The invention of the arch cannot be ascribed to any particular people with certainty; it may have been made by different nations at the same time in different localities; in countries possessing but little wood, or where large blocks of stone were quarried, and men were required to construct a firm protecting ceiling with small pieces of stone, the inventive genius of mankind must then have led to similar results, for necessity is indeed everywhere the mother of invention!

The Etruscans were the first European race to introduce a frequent use of the arch in its buildings, while it was scarcely used by the Greeks, or at least was not accepted as a motive in their architecture, although known to the Egyptian and Phoenician colonists, who immigrated into Greece, and the Greeks must have later seen it among neighboring peoples.

Defensive walls constructed in accordance with Egyptian rules (horizontal courses of trapezoidal ashlars), or after Phoenician rules (polygonal ashlars like those of Tiryns and Argos), are quite extensively found in Greece and are contemporary. Notable in many cases is the double rebate form of the angle of two portions of the wall intersecting at right angles.

Considerable remains of these walls are found in Greece in addition to those already mentioned:--

On Ithaca, -- like that at Tiryns.

On Cephalonia, -- polygonal arrangement.

In Buphagion, -- courses more nearly horizontal, with projections of the ashlars into other courses.

In Paos, -- the same.

In Elateria, -- polygonal and rather nobler than at Tiryns.

In Cortynia, -- arranged more nearly horizontal.

In Psophis, -- almost entirely horizontal.

In Oiniadai, -- horizontal courses with oblique end joints.

In Aiolis, -- polygonal.

62. In Coronea, -- the same.

63. In Abai, -- the same.

In Lycosura, -- the same.

In Daphne, -- the same.

In Platai, -- the same.

In Oince, -- the same.

In Eleutherai, -- horizontal with inclined joints.

In Pharsala, -- the same.

In Messene, -- the same.

In Methana (Argolis), -- the same.

In Kleitor (Arcadia), -- the same.

On Samos, -- the same.

Etc. Etc.

44. Propylea.

When the walls enclosed large temple precincts, as in Olympia, Athens, Eleusis, etc., gateways without decoration were no longer employed, but magnificent portals-- propyleons-- with porticos and roofs decorated by pediments formed the entrance and indicated the facade of the temple, from the simple arrangement at Sunion to that most richly developed at Athens (Figs. 42,48).

2). Retaining Walls.

45. Construction.

Remains of retaining walls have been preserved for us at Delphi and in the temple terrace of the Olympeion at Athens, originally commenced as a Doric building by the Pisastratides. Buttresses at regular distances interrupt the walls, which are battering on their inner sides, giving them great stability with a

moderate use of material. The coursing is uniformly horizontal at Athens, with a tolerably uniform height of the stones (1.84 to 2.23 ft.). Headers and stretchers alternate in the individual courses, although not regularly; 3 stones together make up a length of 18.70 ft.(equal to the distance between the buttresses), with a maximum of 19.69 ft. (Fig. 44). The stones are set without mortar, the headers extending into the wall up to 4.92 ft., and the breadth and height of the stretchers are usually equal. Their faces are in part brought to a perfectly true surface and are partly finished with marginal drafts and bosses. The inclined buttresses project from the wall as much as 3.28 ft.; individual stones of these bond into the masonry; others merely abut against it.

Near the principal cemetery of the Athenians in the vicinity of the Dipylon (now a cemetery near Agia Triada), there still stand magnificently constructed continuous retaining walls composed of extraordinarily fine and beautifully wrought ashlars, polygonal, trapezoidal, and those with reentrant angles. The jointing of this is finely executed in a masterly and finished manner; the faces of the stones are very slightly convex at their centres and are not perfectly smooth, this being caused by the crisp and shelly fracture of the stone. The stones differ greatly in size, running from triangular spalls measuring but a few square inches up to blocks having 10.76 sq. ft. of face (Fig.45).

The beds are horizontal throughout, though the courses interlock into each other. Headers and stretchers alternate quite irregularly in them, the former bonding into the wall up to 4.92 ft., the latter only 0.82 to 0.98 ft. The stones are in contact for but an inch or so in the joints, this being sometimes reduced to a mere edge, in a manner not to be recommended. The interstices between the stones at the back, like the external masonry, are filled dry with little fragments, large uncut blocks then abutting against them to make up the required thickness of the wall.

At the same place, we likewise find a stepped wall of Boros ashlars, whose bosses project an average of 1.57 ins., and which have very finely pointed drafted margins 2.36 ins. wide. In accordance with the arrangement of the bosses, these drafted margins extend around only three sides of an ashlar.

On a prepared horizontal footing course, we find finely executed polygonal masonry of breccia in the southern fortress wall of the Acropolis at Athens, and in the vicinity of this portion are also others, where the smallness of the pieces of blue limestone and of reddish breccia employed is striking. The smallest chips are again used, and economy of the material is carried to the extreme point. The stones bond 7.86 to 23.6 ins.(Fig. 35), and the beds are dressed smooth in the finest manner for a depth of 3.93 to 4.72 ins.

Such bits of walls are frequently only built to fill gaps in the naturally soldi location of an area, as shown by examples on Samothrace[48]: they are then not finished regularly at top, but the top is left irregularly jagged[49].

Note 48. See Gonze, Hauser, and Neumann. Archäologische Untersuchungen auf Samothrake. Vol. 1. p. 29. Vienna. 1875.

Note 49. Similar examples are found in the so-called pagan walls in southern Germany.

One peculiarity also appears in the walls of the Stoa of Hadrian in Athens, subdivided by buttresses, where the ashlars with drafted margins and bosses are set on edge and are unpleasing, as well as the sunken triangular bed joints.

In the retaining walls of the Altis in Olympia next the slopes of the hill, the porous yellow limestone blocks have an average size of 1.15 to 4.26 ft., were connected by double-dovetail wooden dowells (?), and their ends were joined by wooden pins.(The material of the dowells and pins has disappeared). The wall is subdivided by buttresses 2.07 ft. wide and projecting 4.27 ft., which are placed at distances of 19.70 ft.

An interesting combination of polygonal masonry and horizontal courses is shown by the retaining walls of the Theatre in Balbura (Lycian highlands), also furnished with buttresses. The walls are faced with polygonal, and the buttresses with rectangular blocks. Semper assumes the buttresses of the substructure to be merely ornamental, merely parastate, comparable to the ends of the timbers of Swiss houses, -- but they are too massively constructed for this, and where earth lies behind them, they have their actual structural purpose.

46. Stone-cutter's Marks and Setting Marks.

The ashlars, dressed on all sides, and which were completely

prepared by the stone-cutter, frequently bear marks on their upper surfaces, similar to those on the stones of mediaeval buildings. This custom extended over the entire ancient world.[50]
66 It is established everywhere, in Persepolis, Egypt, Jerusalem, Damascus, Baalbec, Sidon, on the Eryx, in Pergamon, on the Treasury of the Sicyonians in Olympia, on Samothrace, in Sicily and lower Italy, and elsewhere.

Note 50. See Richter. Über antike Steinmetzzeichen. 45. Programm for Winkelmann's Festival of Archaological Society in Berlin. Berlin. 1885.

On blocks like the stones of the Cyclopean walls, which were prepared on the site just before setting, the marks are not found. They possessed no meaning for the building, but merely referred to the production of the dressed blocks, -- they were indications of origin, contractor's marks, but were not individual marks of the workmen. Fig. 46 represents such marks from Eleusis and Samothrace.

3). Foundations.

47. Foundations arranged in Layers extending through.

In some cases, it may be found that the entire rectangular area occupied by the plan of the temple was frequently covered by continuous courses of regularly cut limestone ashlars, bonded, but without mortar, even in case of a firm building site, which was found in case of most Grecian temples, built on the solid rock; the excavation for the building was not then made to accord with the plan, but the foundations were benched at different depths according to the natural position of the solid earth, so that in the Parthenon, for example, the northeast angle of the stylobate rests on the solid rock, while 9 foundation courses with an average depth of 1.64 ft. each may be counted on the southern side, and even 22 at the southwest angle, with 5 different foundation courses on the western side composed of various materials; on Poros ashlars 1.87 ft. high are placed 0.95 and 0.92 ft. courses of Poros stone and of marble. Courses of headers and stretchers alternate with those of headers and stretchers in the same course. In the lower courses, the faces are merely flat with imperfect joints; those of the upper courses have drafted margins with bosses or flat panels and a rather complicated arrange-

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ment at the end joints for setting. (See Fig. 47; the bosses below the panels serve for receiving the iron crowbars or for hand holes in setting, and were to be cut off later). The foundation masonry projects only an inch or so beyond the steps of the stylobate on the west side, while on the south it is set back behind this about 4.92 ft. Otherwise the foundations correspond to the lines of the walls of the superstructure.

For the pronaos of the Temple at Phigaleia, the continuous
67. layers of uniform masonry are abandoned; piers of ashlar mas-
68. onry are constructed instead at certain points, the intervals
between these being filled with rubble masonry (Fig. 48).(Emplekton of Vitruvius and Diamikton of Pliny).

Foundation masonry of unequal depth is also employed at the Heraion at Olympia, this also being on a varying site. The Temple partly rests on hard sand, partly on soft river sand. While the eastern portico has no foundation besides a sub--threshold, the foundations increase towards the east to a depth of 8.53 ft. with a width of 12.07 ft. The courses of ashlars in the foundations are not flush, but project irregularly beyond each other and widen downwards. For example, the course beneath the stylobate is narrower than it, while the next course is again wider. Both in this monument and in the Olympeion there, as well as on the Fountain-Sanctuary at Cadacchio, the foundation of the colonnade is separate from the foundation of the cella, the latter merely consisting of a few (1 or 2) courses of ashlars sunk in the ground in accordance with Egyptian customs, which did not employ foundations in courses.

In a temple constructed of noble materials, the masonry of the foundation does not usually consist of the same, but of a less expensive material (see the Parthenon and Theseion), while in those built of porous limestone, the same kind of stone is used in the substructure as in the superstructure.(See Temple of Zeus at Olympia, the Sicilian temples, etc). The foundation walls do not always rest on firm ground; they are not always placed on the rock; we likewise find them sunk in low, swampy
69. places, as in Magnesia on Meander, on Samos, in Ephesus, -- in
the latter place so that the building might not be affected by earthquakes, and that cracks in the earth might not be feared. (According to Pliny, Nat. Hist. 36 - 21).

Very carelessly constructed foundations of detritus and stone

spalls are shown by a Treasury in the Altis at Olympia (Fig. 49), and the projections at the locations of the columns in the interior of the Heraion there (Fig. 50). But this foundation in the latter plays a subordinate part, since thick slabs are laid over the mass of spalls and have a secure bearing on the continuous foundations of the internal columns and those of the wall of the cella. Descriptions of the foundations of this really oldest of Grecian temples with a mixed system of construction are given in the work on Olympia[51], and Fig. 51 shows those of the Metroon in Olympia, by which the mode of execution is most clearly explained.

Note 51. Die Funde von Olympia. Edition in one volume, published by the Directory of the Excavations at Olympia. Berlin. 1881. pp. 32 - 35; Pls. 34, 36.

At the recently discovered Temple at Lokri, the lowest courses of stones rest on a layer of blue clay 3.94 ins. thick, which projects beyond the stones. The foundations of the different parts of the building are carried to different depths, and the layer of blue clay accordingly lies at various depths.[52]

Note 52. See Mittheilungen des Kais. Deutsch. Inst. Röm. Abth. Vol. 5. Rome. 1890. pp. 177 - 201.

The foundations of Treasury VII in Olympia are placed on a heap of sand, and others are on brook pebbles.

70. 48. Foundations of Circular Buildings.

Fixed starting points in regard to the foundations of circular buildings are given by Fig. 52 (Philippeion in Olympia, Tholos in Epidauros) and by the Arsinoeion on Samothrace. The three outer circular ring-walls in Epidauros support the external colonnade, the wall of the cella, and the internal colonnade. A satisfactory explanation of the three inner ring-walls is still lacking.

49. Connection of Stones by Cramps.

In the foundation of the circular structure of the Arsinoeion on Samothrace, constructed of tertiary sandstone, the two lower courses show no holes for cramps; the succeeding ones have them, as well as the surrounding projecting marble border, while the course resting thereon exhibits none. The cramps themselves are wanting. On the sandstone foundation rose the marble structure.

At a treasury in Olympia, the stones are held together by

double dovetail cramps, just as this was observed and cited on the wall of the Altis at the base of the hill Kronion.[53]

Note 53. Double dovetail cramps are also shown by the foundation stones of the Sanctuary of Athena Polias in Pergamon. Each stone is connected with its neighbor lengthwise by two double dovetails, sidewise by only one.

50. Foundations in Messa.

At the Temple of Zeus there (Olympia), the cella walls rest on bonded slabs of stone, which are held together by iron I-cramps set in cast lead. The pavements of the external and internal colonnades have through-coursed stones, which receive the pebble plastering and the coating of cement.

The foundation of the statue of the deity is treated in a peculiar way. Grooves were cut in the Poros stones and pieces of compact white limestone were inserted in these grooves, on which were laid the joints of the thick bluish pavement slabs (Fig. 53), which rest on drafts and were connected together by I-cramps. The mode of jointing and fitting the marble floor around the internal columns is likewise interesting (Fig. 54).

71. At the Temple in Messa on Lesbos, the foundations consist of the four enclosing, two longitudinal, and two cross walls, which together form a network of 9 rectangles. The two middle rectangles on the ends are filled by a complete foundation of the same kind, which probably does not extend as deeply as those of the principal walls. In the six external rectangles along the sides, a similar continuous foundation begins with the course of the lowest step, so that the courses of the steps of the temple, the crepis, form a compact whole, with the exception of the interior of the cella. The spaces within the rectangles formed by the foundation walls are carefully filled with spalls of the same material, which consists of black trachyte-tufa.

51. Egyptian Foundation Walls.

The foundation walls of Egyptian structures were made but little wider than the corresponding principal walls and usually rest on the solid rock, both arrangements being retained by the Greeks also, as already shown; excepting that one peculiarity has not yet been found on Grecian soil; the sunken or curved arrangement of the beds, somewhat like our inverted arch-

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es, which is regularly repeated at certain distances along the entire facade, and is characteristic of many Egyptian buildings. Viollet-le-Duc regards this slight curvature of the courses as a precaution against the injurious effects of earthquakes upon the structure.

4). Stylobate.

52. Construction of the Steps.

Above the foundation masonry, and with the finest jointing and coursing of the ashlars, rises the stylobate (Plinthus), a stepped construction divided in several parts, which separates the house of the deity from the earth on which it stands, and represents a monumental offering to the deity himself. It serves as a pedestal for the columns and the cella and makes preparation for the building proper. The steps extend around the columnar structure, the different rows projecting uniformly and being usually carried around in like form, sometimes with plain rectangular forms of section, sometimes more richly treated by recessing the front surface, the tread surface being almost always imperceptibly inclined outwards for carrying off the rain water. The stylobate is frequently massive in the older temples in proportion to the height of the columns (compare the Sicilian temples with the Athenian); in the best period, it occurred in a carefully determined proportion to the entire superstructure; 5 or 6 steps, frequently of unequal height (see Selinus and Akragas, also Fig. 55) generally lead up to the sanctuary in Sicilian temples, with only 3 or 4 in Athenian, or even but 2 in the Theseion, the last number being also shown by the ancient Heraion at Olympia.

In case of high steps with a rise of 1.18 to 1.97 ft., since they cannot be considered as being carried around as steps for ascent, in order to make it possible to ascend the substructure, special steps for use are also usually cut out or inserted at the eastern end, either extending across the entire front, over 54
3 intercolumniations only, or over but one; in some cases, ramps of slight inclination lead upwards instead of steps. At the Heraion in Olympia, only a single narrow stairway led to the cella between the angle column and the one nearest it on the longer side. The uppermost step usually serves as a base for the columns and has a breadth somewhat greater than the diameter of the col-

umn, that it supports; the columns then stand on single blocks (Theseion, Propyleion) or on two abutting beneath the centre of the column (Parthenon), or on long slabs, as between the antae of the opisthodome of the Theseion, where the joints do not coincide with the centres of the columns.

Note 54. Temple of Asclepios in Epidauros; on the Temple of Zeus in Olympia is a peculiar combination of steps at the sides and a ramp on the front end; on the Artemesion in Syracuse before the middle intercolumniation of the front is a flight of 12 low steps of stone 10.95 ft. long.

73, The steps at the Parthenon and Theseion only overlap each other a few inches, 1.18, 4.33 and 5.91 ins., while at Phigaleia (Fig. 56), they overlap nearly as much as their projection; at the Great Temple at Akragas, they are deeply bonded and notched into the masonry of the stylobate, a careful, solid, and complicated mode of construction. They are divided into loaded blocks and those free from all pressure, which are merely inserted. The latter were only set after the building was complete and the scaffolding removed (see ruins of Egesta), to avoid injuries and additional work afterwards. Inserted steps (step blocks) would in time and in all buildings become different in height from the adjacent loaded blocks. To this mode of setting the stone and to the slight bonding of the courses together is indeed due the deformation of the substructures of many Grecian temples. On the explosion of powder in the Parthenon, the loaded blocks remained in great part upright and in line, while the inserted ones were all forced from their original positions, frequently 5 inches or more from the original line.

53. Execution.

At the ~~edge~~ end surfaces, the stones only touch each other on the margins over a marginal joint 2.36 to 3.15 inches wide, while the central portion is cut back (see Fig. 56, Theseion, Parthenon, and Temple of Poseidon in Paestum); only thus was it possible to produce the magnificent joints exhibited by the ashlar masonry of Grecian monuments. The dressed blocks were not artificially fixed or otherwise connected together. The Propyleion in Athens and the Temple of Poseidon in Paestum, neither of which was entirely completed, show the surfaces of the inserted and the bonded steps but partially worked; Drafts 1.97 and 2.76 ins. wide

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outline the completed form, while the upper portion projects 1.18 to 1.57 ins. beyond them and is only pointed. On these imperfectly worked surfaces, the columns of the Propyleion at Athens are set by sinking a circle or square area to the true level, and this is very carefully rubbed down; in order that the rain water may not stand therein, small channels are incised and extend to the outer edge. The last dressing of the remaining portion of the stylobate was left until a later time.

The never completed Temple in Egesta exhibits similar contrivances for protecting the angles and surfaces from falling scaffold timbers, tools, or dropping stone spalls, which must have been produced in finishing the columns and the surfaces of the walls. To make the setting of the drums of the columns possible, the supporting blocks beneath the columns here received on the roughed upper surface a circular sinking, carefully worked true, which had a diameter about 3.54 ins. greater than that of the column, and a depth of about 1.18 ins. The drums were set in these sinkings, after a margin 2.55 ins. wide had been cut on them with the required diameter of the column; .97 in. was afterwards dressed off the external surface of the drums (Fig. 57) and .97 to 1.18 or 1.57 ins. from the surface of the stylobate.

The columns and walls usually rise directly from the stepped substructure; an exception is made by only one example, the in many respects enigmatical Sancturay of Zeus in Akragas, where a special moulded base is set on the stylobate, serves as a base for the walls, and is carried around the half columns (Fig. 55).

5). Floors.

54. Floors of Stone Slabs.

The floors of the porticos mostly consist of tolerably large and thick slabs of limestone or marble of square or rectangular form, from 10.78 to 16.15 sq. ft. in area and 0.67 to 0.79 ft. thick, which are carefully jointed together and rest upon separate stone piers (Phigaleia) or on the extended courses of the stylobate masonry. They are laid with some fall from the cella wall to the edge of the stylobate, about 0.459 in. for a width of 13.96 ft. at the Parthenon.

In the same plain manner is also floored the interior of the cella, the pronaos, and the posticum (Compare Parthenon, Phiga-

leia, and Selinus).

The floor of the Temple of Poseidon at Paestum is executed in a peculiar way; raised courses of ashlars 5.25 ft. wide serve as supports for the inner columns; adjoining these are slabs of limestone 1.54 ft. thick and 7.68 ft. wide, their upper surfaces sunken next the wall and forming the floors of the side aisles; 3 rows of slabs are laid in the centre aisle, the middle one being horizontal and sunk to the level of the floors of the side aisles, and the adjacent ones being laid inclined to it (Fig. 58).

55. Mosaic Pavements.

The Temple of Zeus at Olympia forms an exception in the floor of its pronaos; the simple pavement of slabs is abandoned and gives way to the magnificent mosaic, made of pebbles from the Alpheios (Tritons surrounded by palm ornaments, the individual panels being bordered and separated by fret patterns), discovered and published by Abel Blouet. According to Pausanias, the portion of the floor immediately before the statue of the deity was not laid with marble, but with black ashlars; a raised border of Parian marble surrounded the black panel in a circle, so as to prevent the oil from flowing away.

Olive oil was here poured upon the ivory, so that it might not be injured by the marshy location of the Altis; water was used instead of oil for the chryselephantine statue in the Parthenon; the statue in the Temple of Epidauros stood over a fountain, so as to make this saturation unnecessary; the last statement of Pausanias was not corroborated by the excavations.

The floor of the portico was composed of small river pebbles set on edge in mortar, then covered by a coating of smooth stucco mortar, while the side aisles in the interior had a coating 1.57 ins. thick on a basis of stone slabs. The remains of a marble facing in different colors at the entrance side belongs to the Roman period.

Plastered and colored pavements are also found in smaller temples in other places, as for example, floors of red stucco on a bed of limestone slabs at Egina; the plastered Sicilian temples must have had similar floors of colored stucco.

6). Walls of the Cella.

56. Form.

Walls enclose the sacred apartment, where statues of the deity and gifts were placed, secluding these from profane eyes and affording to art works protection from the weather and from theft. A consecrated internal apartment was surrounded by them, richly ornamented architecturally and decoratively, and it was enclosed above by a protecting ceiling. In accordance with its developed purpose, this was externally treated plainly and without ornament, either constructed of limestone ashlars with a coating of stucco, or of marble ashlars with the most careful jointing, the joints almost invisible, and internally decorated by paintings.[55]

Note 55. As stated in the Introduction, unburnt bricks were also employed instead of monumental ashlar masonry in the oldest temples, as well as later on account of lack of means, probably in the manner described for the walls in Troy. The Heraion in Olympia should be included here.

Being vertical and "subject to the general law of proportional development", the walls consist of a broad base projecting beyond the foundation, of the wall proper, and of a crowning cornice, or slightly projecting terminal member on which rest the ceiling beams. The proportion of thickness to height in most cases varies from 1 to 9 to 1 to 10, or 1 to 10.5, while the height goes 2 to 2.5 times into the free length, or the longest free portion between transverse walls; hence there results from this always a great, or at least an average, stability of the walls.[56]

Note 56. See Rondelet. Traite theoretique et pratique de l' art de batir. Paris. 1856. pp. 2 to 17.

56. If in the masonry of retaining walls, the strength and character of the masonry are made prominent by the coursing, batter, buttresses, and the rough visible faces of the individual ashlars, these ideas decidedly recede into the background in the aspiring walls of the cella, free on both sides. The walls are battering inside as well as outside, though not in all cases and in a perceptible manner; Egyptian tradition required a considerable batter on the exterior of the walls of the structure, but it scarcely occurs here. The same feeling that desired the columns to be diminished upwards, must have likewise prescribed a corresponding diminution in the thickness of the walls. The

most apparent reason for the construction of walls inceasing in thickness downwards was indeed in Egypt, as everywhere, the greater durability, solidity, and stability of masonry arranged in that manner. The particular motive of the primitive dykes of the Nile was not required for this, as frequently assumed; mankind usually soon observed that a body stands the more firmly, the broader its base. The probability of its better preservation was indeed the cause of the careful dressing of the external surface, exposed to the wind and the weather.

57. Construction.

The base of the wall generally consists of one or two low plinths projectink beyond each other (.98 to 1.48 ft. high), or sometimes more, sometimes fewer (Parthenon 2, Egina 2, Phigaleia 1), the lower one of these usually having the least height (as likewise frequently occurs on the stylobate), or of a richly moulded base with plinth, cyma and band, as on the Theseion,
77 these members then being returned around the ends of the wall, for which they become formal pier bases. Above this extends a double band course 2.62 to 4.66 ft. high in the various monuments, and which projects .31 to .39 in. from the true face of the wall. These ~~two~~ bands are sometimes of equal, sometimes of unequal height (compare Phigaleia, Paestum, etc., Figs. 59, 60), and do not touch each other in the centre of the wall, and only along a border on the end joint, worked to fit as closely as possible. The proportion of height to length in these is 1 : 2 to 1 : 2.6 (Parthenon, Theseion). A moulded base and projecting band course form the accented base in all cella walls (see Temple S at Selinus, Paestum, Egina, Olympia, Parthenon, Phigaleia, Theseion, Propyleion, etc.: Sicilian temples more commonly employ uniform courses throughout): above this commences the uniform coursing, the Isodomon of Vitruvius, of ashlar masonry bonded with extreme care. The courses are of uniform height up to the cornice and exhibit on the external surface a ratio of 1 & 2.4 of height to length. Headers and stretchers, the latter not touching each other in the middle of the wall, alternate in the courses; mortar is not used, but a sufficient connection is obtained by means of pieces of iron set in lead. Small iron dowells connect the stones vertically and thus prevent the removal of one stone from above another, and iron I-shaped

cramps connect them lengthwise (Fig. 61); they again merely touch each other on a surface 2.36 to 3.14 ins. wide on beds and end joints. Not only marble ashlars, but even the common limestone ashlars (see Egina) were dressed and connected together in the same careful manner. Behind the dowells are usually found small holes, the so-called "bar-holes", cut in the upper bed, in which the crow-bar is inserted to slide the ashlars together.(Compare Parthenon, Heraion at Olympia, and the Mitt. d. Kais. Deutsch. Archaeol. Inst. Athens. Abth. 1881. Pl. 12). Bronze was never used as a common material for cramps here; belief in its presence has unfortunately aroused the avarice of mankind in but too many cases and has contributed to the destruction of many monuments. Even on Attic soil may be seen the criminal traces, the cutting away of columns and ashlars at bed and end joints, scarcely any monument being free from these trial holes!

On the Heraion, and also in part on the Temple of Zeus in Olympia, the base slabs of the wall are arranged on the exterior alone, while the courses in the interior are constructed with low ashlars. The ashlars then have, for example on the Heraion, a thickness of 1.22 ft. and a length of 7.38 ft. with a height of 3.41 ft., which corresponds to four courses of ashlars 2.63 ft. thick. On the Opisthodome (northwest angle) of the Temple of Zeus, the side walls are composed of two courses of slabs connected by iron I-cramps set in cast lead and together 4.4 ft. thick with a height of 5.73 ft. The slabs in the cella wall are 8.38 ft. long, 2.2 ft. thick, and 5.73 ft. high, corresponding to courses of ashlars 2.46.ft. thick and 1.97 ft. high. While in the Temple of Zeus, the ashlars are indirectly connected by iron cramps, which also occurs on the Metroon, and indeed already in the masonry of the substructure, the dressed ashlars of the Heraion are joined without any connecting material, and the blocks do not touch in borders but in sharp angles, produced by undercutting the end joints of the ashlars.(Cut, p. 79). This kind of jointing and dressing is the older.

Also without the use of iron cramps, a temple wall 2.1 ft. thick was moreover constructed during the Hellenistic period in Sillyon[57], being indeed built of limestone ashlars with smoothly dressed faces, where a course of headers alternates with two

courses of stretchers in height.

Note 57. See Niemann & Petersen. Städte Pamphyliens und Pisidiens. Vienna. 1890. Vol. 1. p. 77.

At the Ptolemaion on Samothrace, courses of headers and stretchers alternate in height and show a connection by iron cramps, similar to that of the Attic monuments, excepting that U-cramps are employed instead of I-cramps.[58]

Note 58. See Conze, Hauser, & Benndorf. Neue Archäologische Untersuchungen auf Samothrake. Vol. 2. p. 39. Vienna. 1880.

The exclusive use of iron for bonding walls at the Theseion, the little Temple of Nike, the Olympeion and the Parthenon, in Athens, at the Temple of Zeus and the Metroon in Olympia, the Temples on Egina, in Sardis and Ephesus, the Temple of Poseidon in Paestum, the Temples in Selinus, the Propyleions in Athens and Eleusis, Hadrian's Gate and the Market Gate in Athens, etc., has already been pointed out, and we shall return to this in the succeeding volume of this Handbook (p. 133); the use of wooden double dovetails has likewise been already mentioned.

Besides the U-shaped cramps, bent at a right angle at both
ends, these projections then being set vertical or horizontal,
and I-shaped cramps, as well as square pins and dowells, N-shaped
and Z-shaped cramps are found, though rarely. Besides iron
80 cramps, Hauser found on Samothrace bronze joggles in cast lead
81 and also lead cases from 2.75 to 3.15 ins. high, 1.57 ins. wide
and .59 in. thick.[59] Small bronze cramps of N-shape also occurred
in Sicily; in Epidauros are bronze joggles of the size and shape
represented in Fig. 62; the metallic double dovetails with pins
and set in lead on Lesbos and Samothrace are worthy of mention.

Note 59. Same Work. pp. 70, 71.

Lead double dovetails and iron dowells in lead cases and also lead I-cramps exist in architectural fragments of Poros stone on the Acropolis of Athens (Fig. 62).

Lead was by preference employed for patching and for fixing small ornaments of stone (for example, drops on the mutules), as repeatedly shoun by examples in Athens, Olympia, and other places (Fig. 62).

The iron I-cramps in Olympia have a length of 9.43 to 23.6 ins, according to the dimensions of the blocks of stone to be cramped together, with a cross section up to .98 in high and

.59 in. thick. Small round bronze pins for fixing added pieces may also be seen in some marble cornices in the Acropolis Museum at Athens.

The cornice member, which crowns and finishes the cella wall at top, usually consists of a rather low band projecting but slightly from the face of the wall, and which is decorated by a fret pattern and terminated above by an ogee cyma. When the originally solid end wall was changed into antae or a complete colonnade, another mode of treating this portion was introduced, the form of the cornice of the portico or an allied form being transferred to it, the simpler cnorice being used for the former partition wall, which was then the wall containing the doorway. The architrave fillet could then be introduced for a richer effect, cutting off a plain frieze with the band, as in the Opisthodome of the Parthenon.

The dressing of the external surfaces of the ashlars was only done after they were set in the building itself. The internal and external walls of the portico for the guard, as well as a part of the gateway walls of the Propyleion in Athens, are still in their rough condition; drafts 7.87 ins. wide are carried around them above, below, and on their sides, and indicate the plane down to which the surfaces were to be worked; the ashlars of the external wall still frequently retain the bosses for setting, or rather guide-marks for the work, frustums of quadrangular pyramids, whose sides are from 5.9 to 7.87 ins. square at the base, and their projection is 3.94 ins. or more. The most interesting example in this respect continues to be the never completed Temple in Egesta.

58. Setting the Ashlars.

A peculiar device for raising and setting is shown by the ashlars of the cella walls and the floor slabs of the Heraion in Olympia, where as in Fig. 63, they are perforated and are furnished with bar-holes on their upper surfaces. The same arrangement likewise appears on the oldest architectural remains on the Acropolis of Athens, which are built into the northern wall. One of the Poros capitlas there (northeast angle) has on the abacus the device in the dimensions given in Fig. 63.

At the Heraion we likewise find holes in the steps of the stylobate, extending from the bed to the tread surface; it is as-

sumed that these served for fastening the sacrificial animals.
82, Similar holes are also found in the angles of the casemate piers in the fortress of Euryalos in Syracuse, which certainly served for securing horses.

Through holes were indeed the most ancient means of setting dressed stones; after these probably came the U-shaped grooves, and only then the lewis (Fig. 63).

Note 60. Hittorf already noticed these arrangements, Taf. 89, p. 309 et seq., and mentions a capital from the interior of the Temple on Egina.

7). Doors and Windows.

59. Doors.

As already stated, the doorways first afford access to the cella; their architraves surround an opening of rectangular or trapezoidal form; in the last case, the jambs are not vertical, but are inclined inward, the clear width then being diminished upwards (Fig. 64).

A complete doorway to the cella is not preserved in a single Doric temple; we can only decide on their original treatment by means of fragmentary remains. The jambs of the doorways were frequently formed by the ashlar courses of the walls of the cella extending through to the opening, as already shown at the Treasury of Atreus, or was formed by separately set plain jambs, which were interrupted and bonded with the masonry of the wall by headers or by horizontal lintels(compare Parthenon and Propyleion in Athens), while the top was always composed of a massive horizontal lintel.

Cavities in the jambs of the doorways of the Propyleion, as well as holes and pins in the lintels, permit the assumption of a separate rich casing executed in marble or bronze and attached
83, to them.[61] The doorway of a tomb in the Doric order at Antiphellos, among other examples, gives points on the treatment of the architrave of the doorway (Fig. 64). Recessed in several planes and with a richly sculptured profile, this surrounds the opening; ears on the lintel give to the whole a greater relief and expression; a crowning cap is decorated by anthemion ornaments and forms a further decoration.

Note 61. For bronze coverings, see Normand, Role du Metal dans la Consturction Antique. Enc. de l'Arch. 1883. p. 61 - 81; pls.

878 - 895, with the examples from the Museum at Avenches (Aventicum) there represented.

The considerable dimensions of the clear opening of the doorway in proportion to the apartment to which it affords access, were already pointed out; consequently, besides facilitating passage, it must have had a further purpose of admitting light to the interior.[62]

Note 62. At the present time, we actually light gateways, corridors and vestibules through the principal entrance doors or gates.

Comparing this proportion for several important monuments, the following results are obtained.

Buildings.	Clear Area of Door.	Floor Area of Interior.	Ratio of Areas of Door and Floor.
Parthenon. Mid.aisle.	667.17 sq.ft.	2722.2 sq.ft.	1 to 4.
Parthenon. Opisthodome	462.84	2766.3	1 to 6.
Temple on Egina.M.Aisl.	125.94	449.95	1 to 3.5.
Temple in Phigaleia."	161.46	522.02	1 to 3.2.
Temple R in Selinus.	365.97	3035.3	1 to 8.
Theseion.	97.94	728.55	1 to 7.4

It should not be forgotten that the openings of the doorways extend almost to the ceilings of the apartments.

The outermost side doorways of the Propyleion in Athens were actually intended for ordinary access to the Acropolis and now have clear openings measuring about 52.74 sq. ft. each, which is to be reduced to 48.44 sq. ft.(4.6 × 10.5 ft.) on account of the removal of the casings, which are wanting. If these proportions were satisfactory for the gateway to the Acropolis, they would be sufficient for entrances to interiors, which occupied but a moderate portion of the area of the plateau of the Acropolis, if they were required to serve for a similar purpose. But this was no longer the case, as soon as they were required to fulfil the two-fold purpose of affording acces and of admitting light. For these reasons, we also find the doors of temples to be of large dimensions; through the opened folding doors, which were turned toward the rising sun, an abundance of light streamed into the cella, sufficient for seeing the statue of the deity and the gifts with the desired distinctness.

The elongated cellas of Sicilian temples were most poorly lighted; but if we take into consideration the alleged more favorable conditions of light in the South, even these interiors could always have had a sufficient degree of illumination at certain hours of the day, in spite of the circumstance that the light was further weakened in passing to the doorway behind the columns placed in front of it. We can go to the limit of 1 / 10 in case of our rooms, which require less light, and the same might be permitted to the detached southern temples, mostly quite elevated and not deprived of light by neighboring buildings or narrow streets; yet men never went so far.

84. But the lighting of an Art Gallery in the modern sense was also never required for interiors consecrated to the deity; as mav be found everywhere in the South today in ecclesiastical buildings, a musterious lighting of the interior, whose effect could be heightened by the light of lamps and of the sacrificial fire, was preferred to the dazzling light of day; after entering the sanctuary, one should feel himself separated from the external world.

The entire light, that might stream through the doorway, was not usually found necessary in the interior; the closed folding leaves of the doors were usually of metal and were perforated in their upper parts, admitting sufficient light (the doorway of the Pantheon at Rome, although considerably later, affords the best conclusions in regard to the conjectural treatment of the door of an antique temple), and the temple doors were only opened for their entire width during the ceremonial, when a full view of the statue of the deity must be permitted to the person offering a sacrifice.(More on this subject under Arrangement of Temples).

If the peripteral temple received sufficient light through the opened doors, this was much more the case in the so-called antae-temples. Unbroken and not hindered by colonnades, the bright morning light could penetrate therein; it required no additions through concealed or petty holes in the frieze or in the shadow of the cornice, or through the metopes.

60. Windows.

For this reason, windows never occur in the walls of the cella of any species of temple belonging to the Doric order; in the

colossal and enigmatical structure of Zeus Olympios at Akragas, windows are indeed described between the columns of this pseudo-peripteral temple in the previously mentioned works of Cockerell, Kinnard, Donaldson, and Jenkins and Railton; from the condition of the ruins, the earlier statements can now longer be made clear.

On the left side of the Propyleion at Athens, in the building that contained the paintings and behind a row of columns, there stands a wall, which is perforated by a door and two windows. We can at least see by this how the window was treated in secular Doric structures. The sills of these windows extend through from the side walls to the doorway as a plain rectangular sill course of Eleusinian marble of bluish-black color, projecting but slightly from the face of the wall; the jambs are treated in the style of antae as narrow projecting bands without bases, but have the complete capital of the large antae; a higher course of ashlars also extends clear across and forms the lintel, though it is not otherwise distinguished.

8). Columns.

61. General Treatment.

Free-standing supports intended to receive the burden of the entablature laid upon them should make their supporting strength manifest, and they then awaken in the observer a feeling, as if they rise up against their load with an organic movement, and reisist its opposing pressure. This upward striving must necessarily result in an enlargement where it meets the loading. The same will occur where the free column comes in contact with the ground, and in this way naturally arises its three-fold division into Base, Shaft, and Capital.

In the Doric column, the base vanishes into the uppermost step of the stylobate; a shaft of circular section thus appears
25. without a base and diminishes upwards, with a simply appearing capital, which has a strong projection in ancient monuments. The structural idea controls the form of this column; the shaft is diminished in accordance with statical laws, and the measurements of diameter and height do not vary much in reference to each other (their ratio lying between the limits of 1 to 4 and 1 to 6.5); for the same reason, the pressure of the entablature and the weight of the ceiling are distributed over a larger sect-

ional area of the support, and a more convenient resting place for the architrave is made possible; for reasons of stability, it ends in an enlargement increasing upwards in an ogee curve, and which is covered by a square slab, forming the transition from the circular column to the rectangular architrave. The change from the round shaft to the rectangular architrave cannot be conceived more simply and naturally than it occurs in the Doric column; it appears so self-evident, that it is unnecessary to consider this development as being in accordance with a weak analogy pertaining to the plant kingdom.

The massive shaft is decorated by vertical flutes or channels, which by their stiffness bring out still more clearly the upward growth of the shaft and its capacity of resistance. The circular form of the free column occurs as known from the first; we do not need to consider that the Greeks first made the obvious change, which the stone-cutter must generally employ in producing a cylindrical form. The stone is broken out in the quarry in prismatic form and is then wrought octagonal, sixteen-sided, and finally circular. In view of the octagonal shafts of columns found at Trozene and at Bolimnos, to conclude that a successive development of circular free columns occurred in this way, would be to abandon all possibility of any spontaneous suggestion or comprehension of an artistic idea. No art forms were ever invented by means of the conditions of manual execution. The square pillar occurs at the same time as the octagonal and circular forms, and it is also possible that the known remains of such columns were only intended as preparatory for a later circular form. The model for the cylindrical free column was so near to mankind in the trees of the forest, that no transitional form was required; but the Greeks certainly no longer needed to make any experiments in this way in the year 1000 B. C., after the perfected stone column had already been employed 1200 years earlier in Egypt, and the sensitiveness of the two countries towards each other in the earliest period has been shown.

The first stone columns with diminished and fluted shafts rising from a flat and disk-like base and crowned by a square abacus, on which is laid the rectangular architrave, both portions being indeed cut from one block of stone, are found in the Grotto-Tombs of Beni-Hassan, of the era of the 12 th dynasty (2200

B. C.), and again later in the buildings of the 19 th dynasty. (1392 B.C.). These pillars bear the name of "Protodoric" and may have served the Greeks as models; to have created from these poor materials the perfected form of the Doric column is the incontestable merit of Grecian genius.

62. Entasis.

The shaft of the column does not always diminish in a straight line; a slight outward curvature of this (Entasis) gives the column more animation and recalls the lofty trunk of the Egyptian date-palm, slightly swelled at its mid-height and only bearing leaves at its top. On the older monuments, the character of the column is stumpy, even to heaviness, and the diminution and entasis are frequently so great, that the shaft receives a sack-like appearance; (compare the Temple of Demeter and the Basilica in Paestum); the shaft is often diminished without the elastic curvature, appearing sluggish and lifeless, as on the Temple in Corinth. (Fig. 65).

63. Diaemter.

Vitruvius requires the diameter of the column to go 6 times into its height, exclusive of the capital, so that the "Doric column may exhibit in buildings the proportions and the sturdy beauty of the masculine body". Neither in the early nor in the best period is this proportion of 1 to 6 retained in Grecian works. (It varies from 1 to 4 to somewhat more than 1 to 5.5, but it was exceeded in buildings of the late period, as in Nemea, 1 to 6.5). The columns of Corinth and Nemea may be regarded as being in their proportions the minima and maxima of the Doric order (Fig. 66).

64. Flutes.

The concave flutes (Rhabdosis) animate the shaft and commence directly on the uppermost step of the stylobate[55], usually terminating in a curved form beneath the echinus. The channels have a flat elliptical, oval, or segmental form, according to the material of which the columns are constructed, and intersect each other in a sharp edge, equally delicate in stuccoed and marble monuments; only on one temple in Selinus (S) are narrow fillets left between the flutes on a few columns. Vitruvius requires for their form the simple circular arc, described from the centre of a square constructed on the width of the flute as a base, and touching the angles of the square; the line obtained in this way

agrees in the fewest cases with those preserved on Grecian monuments. (On a Poros fragment on the Acropolis in Athens, the flutes are spirally arranged).

Note 63. An exception is made by an angle column of the so-called Artemesion in Syracuse with an inscription referring to Apollo on the uppermost step of the stylobate, where the flutes first begin above a plain base-band 11 ins. high, by a column of the Heraion in Olympia, and by a Grecian temple in Pompeii. Also see Die Stadt Syrakus im Alterthum. Authorized German edition of Cavallari-Holm's Topografica Archaeologica di Siracusa by B. Lupus. Strasburg. 1887. pp. 80 and 288.

Sixteen to twenty (twenty-four extremely seldom) such flutes surround the surface of the column: the first number occurs on a few ancient monuments, and also on such as belong to the late period (for example, the Temple in Sunion); the last number is that common on Doric monuments of all ears. The Heraion in Olympia, with its columns having 20 flutes, exhibits one with 16. As shown by the columns in Sunion, the smaller number of flutes is no evidence of a greater age of the monument. Flutes are found in some buildings, interrupted by one or more incisions before they terminate, i. e., a separate necking (hypotrachelion) is cut off by them but a little below the capital. These incisions never resulted from technical causes, for otherwise, similar original conditions must have everywhere produced similar practices, and these would be everywhere found. But no incisions at all and consequently no separate necking of the column are found on the oldest sanctuaries in Assos, Cadacchio, Metapont, the Temple of Demeter and the Basilica at Paestum, Temple S in Selinus, the Artemesion at Syracuse, the Temples of Concord and of Zeus at Akragas and Olympia; only a single one is found on the great Temple of Zeus and Temples D and R in Selinus, the Fountain-Sanctuary in Cadacchio, the Temple of Hercules in Akragas, the Theseion, Parthenon and Propyleion in Athens; but two on Temple A in Selinus; three in Corinth, on the Temple of Poseidon in Paestum, and on the Temples of Athene in Syracuse, on Egina and in Phigaleia, with even four on a Poros capital on the Acropolis in Athens (Fig. 67).

On a second fragment of a column with spirally arranged flutes at the last place, the recurved form at the necking is also

preserved, and it has the same shape as in case of vertical flutes.

88, 65. Capital.

Before the broad expansion of the echinus is developed, and especially in Sicilian and Italian monuments (one example also in Tiryns), there occurs a cove, into which the flutes either intersect or terminate (compare Selinus), or this is ornamented by a fully sculptured circle of leaves, finishing next the flutes with an astragal, beneath which the flutes end abruptly, only in approximately semicircular form or with corners slightly rounded (compare Temple of Demeter and Basilica at Paestum). Two such margined recurved leaves occupy the width of one flute. Some columns of the Basilica have the ends of the flutes bordered and enclosed by a small astragal, causing the lower roll-like margin of the leaves to project even more strongly in the form of an astragal. Above the series of leaves is another half-round moulding on the echinus, that according to some columns must be considered a beaded astragal. Others show above the circle of leaves an ascending anthemion ornament or interwoven bands (Fig. 68). This richly sculptured treatment of this part of the capital disappears in the best period and gives place to several annular rings (Annulets), which follow the outline of the echinus and project from it but slightly. The line of the end of the flute coincides with the lower edge of the lowest annulet; this is then made wider than the others. Three, four, or five such rings occur above each other or are grouped together; but we also find annulets above the plain concave moulding of ancient Sicilian columns (com- 255 pare Selinus). The annulets have but a slight projection and width on the marble structures at Athens, and can only be directly executed in that material, or only in the stucco coating over coarse limestone. On the Temple of Poseidon in Paestum, we meet with a still further development of the terminations of
89, the flutes. The edges are carried to the edge of the lower annulet and stop there quite abruptly; the form of the echinus then passes cup-like into the cylindrical form of the shaft, and the surfaces of the flutes intersect the cup-like surface in sharply drawn curves.

On the monuments of the older style, the echinus is a strongly

projecting, flattened or convex, often weakly relaxed line, which becomes in works of the best period a tensely ascending and slightly projecting nearly straight line with a quick inward curvature at the abacus; on those of the later era (as in Sunion, Nemea, and the Market Gate in Athens), the echinus shrinks to a delicate and refined, though somewhat effeminately appearing member; it is then bordered beneath by half-rounds instead of annulets. (Compare the capitals found in the excavations between the Theatre of Dionysos and the Odeion in Athens). A tangent drawn to the curve of the echinus at its lowest point often scarcely makes an angle of 30° with a horizontal in ancient structures, while in those of the best period, this increases to one of 55°.

A square covering slab, the Abacus, sometimes exceeding the echinus in height and sometimes inferior to it, projects very little or not at all beyond the greatest projection of the echinus and forms the termination of the capital; this has to make the transition from the circular to the rectangular form, to receive the horizontally supported structural members of the entablature and to afford them a firm resting place. The echinus and abacus remain in all periods without sculptured ornamentation; small bordering mouldings or crowning mouldings first occur on the abacus in the later period (compare Capitals from Athens)' sculptured decorations of the echinus are unique and are only to be found on the small Doric-like capitals above the head-cushions of the caryatids of the Ionic Erectheion, if these may or should be in a general way included among Doric capitals.

66. Decoration in Relief and Color.

Though sculptured ornament was excluded from these portions, decorations painted in colors and harmonizing with the ornamentation of other members were the more abundantly employed. Vestiges of painted ornamentation on the echinus and abacus of a Doric capital are no longer to be traced in any building, but its form may be learned from fragments of allied members and from paintings on vases. The echinus of the Ionic and caryatid capitals exhibits ovate leaves, partly sculptured and partly
90, painted; the fret pattern occurs frequently enough on band-like members, so that both forms of ornament may be assigned to the members in question. Instead of the ovate leaves pointing down-

wards (egg-and-dart moulding), the anthemion ornament is found in paintings on vases aspiring upwards, so that an upward or downward pointing ornamentation symbolizes opposition, a crowning, or compression.

Semper recognizes in the oval leaves nothing more than a series of conventional unities, by which Above and Below are indicated in the form, while Bötticher everywhere holds them to be recurved leaves, half covering themselves up.

On the strongly projecting capitals of Selinus and Paestum, the decoration of the echinus by recurved ovate leaves appears disproportionately coarse in comparisson to the other ornamentation, even seeming monstrous.

The employment of decorative elements of opposite direction on the same architectural member may not be surprising, in so far as one is justified in regarding this form as compressed and as opposing this pressure. The anthemion and egg-and-dart ornaments also occur everywhere as decorations of the cymas of the pediment cornice (compare Parthenon and Propyleion in Athens), and on the same members are again found the upward aspiring and the descending ornaments.

On the Francois vase, two forms of Doric capitals occur on the Doric buildings painted thereon, one having a disk-like projecting echinus capital with rectangular abacus, the other with a pear-shaped transitional member and a moderate projection. (Fig. 69). Similar forms are found on other vase paintings of the earlier period.

The pear-shaped capitals have preferably been assumed to be inventions or fancies of the painter; but the evidence for them in stone has been found in the steles or the supports for consecrated gifts, which were discovered in the so-called Persian rubbish on the Acropolis of Athens, and which are now exhibited in the Acropolis Museum there. They are remarkable for the colored decoration of the abacus, here circular, by interlaced fret patterns, and of the cymatium by anthemions turned upwards and downwards (Fig. 70). Bötticher's theory of the recurved leaf
91. does not apply here.

92. The Cypriote capitals (see Golgos in Fig. 70) with their simple forms of echinus must also be of high antiquity, and have likewise received their development in the same heavy manner in

the Athenian marble stele capitals, excepting with the difference that the abacus assumes the circular form.

One of these Cypriote capitals (Fig. 70) exhibits grooves on the cyma extending in a direction nearly normal to the profile. Similarly arranged are also the varied scale-bands on the Athenian stele capital, whose colors are indicated, and whose abacus again exhibits the fret ornamentation. Other allied capitals show the recurved leaf on the echinus, as on the cushions of caryatids, or an aspiring palm decoration.[65]

Note 65. We had already ten years since mentioned the possibility of the decoration of the echinus with reference to the cymas of the Parthenon and Propyleion, but in consideration of Bötticher's theory, slight attention was paid thereto. Borrmann now states: (Stelen für Weigeschenke auf der Akropolis zu Athen. Jahrb. d. Kais. Deutsch. Arch. Inst. Band III, p. 279. Berlin. 1888). "It may not be denied that the ornament is very frequently in a quite loose relation to the structural form covered by it, and is manifestly not in the ideal combination required by Bötticher's theory. The egg-and-dart moulding is in some places without tectonic meaning, and the scale ornament is merely a covering decoration, but in nowise characteristic. The leaf-waves that separate the lower from the upper row of leaves is distinctly separated from the recurved parts and makes it at least doubtful, whether we have to accept with Bötticher the origin of the Doric cymatium as a result of loading, with the points of a series of recurved leaves". -- Consequently the ornament does not appear to be intended to manifest the statical function of an architectural member, and is then always arranged for a purpose, i. e., it closely adheres in development and direction to the movement of the profile.

A third very ancient torus form of capital exists on the columns of the Lions' Gate and of the so-called Treasury of Atreus in Mycenae. Between the square abacus and the round torus, a preparation for the transition is attempted, but its form is not definite and clearly expressed, and the transition from the torus to the shaft of the column is made by a cove, covered by a row of leaves.

The row of leaves beneath the echinus (painted) is shown by the old capital of the column of the Tomb of Xenvares[66] and is sculptured on the capital from Paestum, where to the row of leaves are

are also frequently added anthemion ornaments or connecting bands (Fig. 70). In Mycenae, the entire torus was covered by plaited and volute ornaments, while in Paestum only the lower portion of the strongly projecting echinus was decorated.

Note 66. See Fig. 70; also Puchstein, Das Ionische Capital. 47. Programm zum Winkelmannsfeste d. Arch. Gesell. zu Berlin. Berlin. 1887. page 47.

The old capitals in Selinus likewise have the cove between the echinus and the shaft.

A widely projecting form of echinus (dish-like) is shown by the capitals of columns on archaistic vases (see in Fig. 70 a lecythos found in Athens), by the stele capital of Xenares, and after these, the capitals of the oldest period in Paestum, Syracuse and Selinus.

The strong projection should be referred to an original rectangular form of capital, projecting on two sides only, as shown by the Athenian stele cap (Fig. 70), to which we have added a form from the Asclepion in Epidauros, certainly of a later period. The widely projecting echinus form of the narrow end of the capital is undeniable here and is technically justified after its use in Epidauros.

But in addition to the echinus, the cymatium also occurs as a characteristic part of the capital of the free column, indeed
93, above an octagonal or circular shaft (Fig. 70).[67] The abacus then corresponds to the form of the shaft and is consequently octagonal as well as circular, and the cymatium is a connection of the cove or ogee and the recurved leaves.

Note 67. See Le Bas. Voyage archaeologique en Grece et en Asie-Mineure etc. New edition by S. Reinach. Paris. 1888. Also Antike Denkmäler. Pub. by Kais. Deutsch. Arch. Inst. Berlin. 1888. Pl. 29.

The ogee or pear-shaped capital of the Francois vase and of the Athenian stele cap from the Persian rubbish has not certainly found acceptance in the stone architecture of the Greeks, just like the heavy torus of the Cypriote and of the corresponding stele caps; but on the other hand, the dish-like form with the cove with leaves came into use and was retained almost until the time of Pericles.

The cymatium also, the compound form, was not accepted for

the columns of the building, but indeed for crowing the antae. In capitals of the early period we therefore see elements introduced from Asia Minor; in the shaft, we recognize the Egyptian stone column!

According to the stele cap found in the Persian rubbish (Fig. 70), the assumption may well be permissible, that the Greeks had quite early replaced the wooden post by the stone pillar, and indeed before they introduced the massive stone columns of the Egyptians in their architecture. We have pointed out the primitive stone model for the capital and shaft of the Doric column, and in this and not in the former is to be sought the original and the transitional forms from wood to stone.

That the later Grecian stone structures are a direct imitation of wooden structures is justly contested by Hübsch, Bötticher, and Viollet-le-Duc, since this method would be opposed to reason.[68] One would make the same error by assuming the ancient Doric stone buildings to have been a direct imitation of exclusively wooden structures, as if it were desired to make it credible that they should have been primarily conceived as stone structures. If the ancient writers commonly mention old wooden columns in Grecian sanctuaries, which were gradually replaced by stone columns, both certainly had forms differing from each other. The greatest measurements of wooden comuns, that we have found in old wooden buildings (on this side the Alps) do not attain the diameter of 4.26 feet required in the Heraion in Olympia, for example.[69]

Note 68. Also see Dieulafoy, Part 2, p. 51.

Note 69. We cannot rise to a belief in wooden columns with clay capitals made on the potter's wheel, as Fenger suggests in order to explain its forms. Dorische Polychromie etc. p. 16. Berlin. 1886.

67. Drums of Columns.

The shaft of the column is either made of a single piece (monolithic), or it consists of numerous blocks of stone (drums) carefully set on each other and very closely touching each other on their bearing surfaces, and not being cemented together by other materials like the ashlars of the walls of the cella.

In order to easily obtain a good and beautiful joint, which

was absolutely necessary in columns for sake of appearance, especially when they were not covered by a coating of stucco, the bearing surfaces were undercut somewhat deeper towards the centre, only the annular portion near the exterior being employed for support. The margin was therefore more carefully wrought than the portion lying further inward, in which are usually found deep strokes of the double-pointed pick (Fig. 71). The annular surfaces intended for bearing were rubbed; the fin-
94 al preparation being effected by the rotation of one block on another about a wooden pin at the centre. The central parts of the beds have at the centre holes about 5.1 in. square and deep, in which prismatic wooden blocks were fixed, which were connected together by cylindrical wooden pins. The latter were fixed in one (lower) block, while the upper one was movable about them, thus permitting rotation without moving the centre of the stone out of position. If these wooden blocks had only been required for fixing the drums, their complicated form would have been unnecessary. The material for fixing them would not resist for a long time, and they were also too small in proportion to the dimensions of the blocks. In spite of the undercutting of the central portion, the bearing surface is large in proportion to the load. On the lowest drum at the Parthenon, it measures 27.38 sq. ft. - 8.45 sq. ft. = 18.93 sq. ft.; the weight of the drums above it, and of the corresponding portion of the entablature, ceiling, and roof, is about 149 tons; it is therefore loaded with about 7.87 tons per sq. ft., while marble commences to crush under a load of 180 to 450 tons per sq. ft.

The lowest drum is not connected with the finished step of the stylobate by pins[70] and is not sunk into it, but is only freely placed upon it.

Note 70. An exception is made by the Temple of Hercules in Akragas and the Sanctuary of Athene in Pergamon and others.

95 68. Position of the Columns.

The columns do not stand vertical in Attic monuments and on the Temple of Poseidon in Paestum, but are somewhat inclined towards the wall of the cella, and the angle column in the direction of the line bisecting the angle of the stylobate. The inclination is very slight, but is plainly visible to an eye skilled by practice. The inclined wall has the inclined column

as a result.

Optical and structural reasons can scarcely have required the slightly oblique position; the diminution of the columns, the receding of the length and breadth of the entablature as opposed to the stylobate already gives to the structure in a very realistically expressed way the character of pyramidal aspiration, and the externally weak addition of the inclination of the columns was not required for this purpose; with the thick and massive form of the free supports, this has no importance for any structural purpose. An ancient Egyptian architectural law was evidently followed in this, which certainly no longer had much meaning in this weakened form: but it was also perhaps desired to lessen in the portico the divergence of the two enclosing surfaces, of the wall of the cella and of the columns. (Compare Parthenon, Theseion, and Propyleion in Athens, Temple of Poseidon in Paestum).

The inclined position of the columns was effected in execution by the insertion of drums with diverging beds between those with parallel beds (Figs. 72, 73).

The first of these was laid on the step of the stylobate and the last was beneath the capital. The axis of the column then rose perpendicular to the upper base of the lowest drum, the successive drums with parallel beds being arranged parallel to this. The lowest and uppermost drums of the buildings named measured on their external surfaces in an intersecting plane perpendicular to the cella wall, consequently do not exhibit equal heights; the upper drums further show the greater height on the side opposite that of the lower, since a horizontal resting place must be arranged for the architrave. (Compare the construction of the columns of the Parthenon).

At the ends of the Parthenon (the sides are destroyed at the centre), the uppermost and lowest drums exhibit another peculiarity, since they also have different dimensions on their surfaces on a plane passed through their centres parallel to the tympanum.
96. The larger measuements on the lower drums are in most cases on the surfaces towards the sides of the building (to right and left of the centre of the building); the reverse occurs on the uppermost drums, where the greatest measurements are found on that side towards the middle of the building.

The differences between the two surface lines of the lower drums are not uniform, but diminish from the angle column towards the middle of the building for drums varying an inch or so in height, though not constantly or uniformly to right and left, so that omitting the angle column, the following differences in measurements result for drums averaging 2.89 to 3.11 ft. in height.

97. Inches.	.472	.354	.118	.000	.118	.472	on East end.
Inches.	.394	.197	.079	.197	.275	.275	on West end.

With some forcing and in accordance with an imperfect passage of Vitruvius, one might conclude that a further arrangement of the axes of the columns was intended, were it not that the equal and unequal measurements on the lowest drums in a direction at right angles to the wall of the cella permit the possibility of indeed very slight inaccuracies in the preparation of the surfaces on which they rest, which might easily occur with the mode of construction described, and that the deformations of the stylobate make any positive conclusion impossible.

Differences in Inches.

1.575	1.024	1.024	1.024	0.945	0.945	0.945	1.457	on East end.
1.220	1.221	0.787	----*	0.984	0.866	0.866	1.535	on West end.

* *Note 71. Can no longer be measured.*

Height of Drums.

2.82 to 3.22 ft. on East end.

2.92 to 3.48 ft. on West end.

Considering the deformation of the stylobate and the differences in measurements of the lower drums, if the positions of the axes be laid off, which may best be made clear and visible by a disproportionate increase of the measurements of the heights, the irregularities appear disturbing, though scarcely visible in reality, according to the graphical representation in Fig. 74, but it will hardly occur to a practical man to deduce from these imperfections special rules for the construction of buildings. The Parthenon and Propyleion have withal suffered so much from destruction in all ways, that we cannot declare everything now found to have been originally intended in its entire extent.

69. Technical Execution.

The practical construction of the columns may have been as follows. The drums were first dressed roughly to a circular

form, though the beds were already dressed smooth; for more convenient transportation and perhaps also for hoisting (setting), there were left on the external surface 4 strong bosses diametrically opposite each other (projecting 7.87 ins. and 16.56 ins. wide), shown by unused and unfinished drums on the Acropolis at Athens. These were placed on each other in this condition (as shown by the unfinished Temples at Egesta and Sardes), the flutes being worked as guides on a certain height of the lowest and uppermost drums alone, and only completely cut out after the completion of the building.

70. Quarrying and Dressing of Shafts.

By a carriage drive of 1 3/4 hours over a good road, one now goes from Castelvetrano to the stone quarries of Selinus, the Cave di Campobello, which now afford us information in regard to the mode of quarrying the shafts of columns and ashlars for the Temples of Selinus.

The shafts were not cut out of loosened prismatic blocks there, but the high drums were cut out of the rock in circular form and dressed smooth on the external surface with due regard to the diminution. Narrow annular passages 1.97 to 2.63 ft. wide were cut out around each piece of a shaft, in which the stonecutter had to undertake its cutting and preparation by the pick. As if shut into cells, which are merely separated from each other by narrow spaces, and whose walls are cut parallel to the diminished shafts of the columns, the blocks still stand there fast to the solid rock; they have a diameter of 10.16 to 10.75
98. ft. with a height of 12.62 ft. Only after this preparation,
99. which was justified by the great dimensions of the blocks and the thereby increased difficulty of moving them, were they detached from the rock, for a groove 8.25 ins. wide and 15.7 ins. deep was first cut around the shaft at the bottom, after which they were detached. (Fig. 75).

Dressed and loosened drums ready for transportation lie in the vicinity of the still fixed blocks. These massive stones must have been moved about 7.5 miles over a hilly country to the site of the building.

For quarrying ashlars for walls, we find that the ledge was broken off vertically for a depth of 3.28 to 19.7 ft. The upper surface was dressed off horizontally; channels 5.9 to 7.1

ins. wide were cut therein around ashlars 4.92 by 3.94 ft. and 1.97 ft. high.

For the Ionic columns of Temple G, the preparation of the columns in the quarry was carried still further, for the outer surfaces were dressed off in polygonal form according to the number of the flutes, these prismatic surfaces being again separated from each other by fillets, which corresponded to the later widths of the fillets between the flutes of the finished columns. Then after the erection, it was only necessary to cut out the flutes; all other arrangements for them having been previously made.

It was 2300 years since, that the invasion of the Carthaginians put a sudden end to this stone-cutting.

In Egesta the drums were of different heights, varying in dimensions from 3.05 to 4.14 ft., and are throughout dressed with
/00. parallel surfaces, so that an inclined position of the columns in this temple is not certain.[72] The same may also be observed on the Temples of Akragas, so that the rule shown on the Attic Doric monuments has an exception throughout Sicily. It must likewise be noted as an exception, that the lowest drums of the columns and the stylobate blocks supporting them in the Temple of Herakles in Akragas exhibit holes for pins, which are evidence of a mechanical connection of these drums with the slabs of the stylobate. The columns of the Southern side of this Temple have been moved outwards by earthquakes, and therefore all the holes for dowells are visible, both in the stylobate and in the bearing surfaces of the lowest drums.

Note 72. Hoffer also gives in Allg- Bauz. 1838, Pl. 238, the dimensions of the sides of the drums somewhat different from those in Fig. 74. The differences for the angle columns result from the mode of measurement, when he takes the measures in a plane similar and parallel to the pediment facade, while they were taken diagonally by me. Otherwise, the differences (see Fig. 74) only amount to .039, .078, and at most, .118 inch, which might result from inaccurate scales and from the incrusted external surface of the material. For the 6 th column from left to right, Hoffer gives 3.45 ft. for the inner external surface, while I have written 3.48 ft. An error occurs here, whose correction would move the axis more to the left.

A connection of the drums of the columns with the stylobate slabs by dowells is likewise shown by the columns of the Sanctuary of Athene Polias at Pergamon. The sites of the columns exhibit round holes with grooves for pouring in lead in which were fixed round pins 3.15 ins. in diameter. Square holes in the d drums of the columns correspond to these.; the latter had beds rubbed all over, so that they touched over their entore extent and not merely over a border or ring. The slenderer proportions of the columns of the later period (here the 4 th Century B.C) indeed caused the changed practice.[73]

Note 73. See Bohn. Alterthümer von Pergamon. Band 2. Berlin. 1885. p. 22.

A very complicated and detailed preparation of the flutes is shown by a never finished drum on the Acropolis of Athens (Fig. 70), and of especial interest should be the mode of joining the marble floor slabs beneath the Poros columns in the cella of the Temple of Zeus in Olympia (see Fig. 54) with the beginning of the flutes on the former.

For accurately locating the centre of the column. the arrangement was employed in the Temple of Zeus in Olympia (West side), that at about the centre of the stylobate slab, which was to receive the column, a hole was cut about as large as the hand, and this was filled with lead and leveled off. The centre of the
101 column was then marked on the lead by two lines intersecting at right angles, and it was afterwards set. The porous building material in Olympia made this precaution appear necessary.

After the column had been carefully dressed circular with due attention to the entasis, lines drawn on its surface and extending from the upper to the lower guides traced the intersections of the flutes, the hollows then being worked out between these according to fixed templates. From this also resulted their unbroken and stiffly rising course, exactly fitted to each individual drum, as well as to the varying diameters of the columns, though these differ but slightly in Attic monuments, and probably also to the unequally great entasises. These irregularitees are frequently quite important in older monaments; on the Temple of Zeus in Olympia, the diameters of the columns differ from 1.97 to 3.54 ins. (in 7.22, 7.38 and 7.51 ft.), and even as much as 11.4 ins. on the Heraion in Olympia, though indeed there for oth-

er reasons. The angle columns in some temples are slightly larger in diameter than the others; yet they all stand along the upper step of the stylobate always at equal distances from its outer edge. (Compare Parthenon and Heraion in Olympia). So slight an enlargement of the angle columns above the others, generally but a small portion of an inch for so great a diameter and small height, contributes nothing to their greater resistance and stability, so that a statical reason for this arrangement may not be assumed; on consideration of the structure, the close spacing of the columns does not without some additional reason leave any basis (which is quite impossible in many cases or must be wilfully sought) for the view, that as the angle columns stand isolated against the sky, they consequently appear of less diameter than the others, so that neither does any optical reason require their enlargement. In case of columns having a necking with a single incision, the intersection of the flutes of the necking, worked on the capital and the uppermost adjusting drum, are separated from each other by a projecting band (scamillus) about .039 in. high. Both portions were nearly finished before being set, at least the upper half of the drum, and this precaution was required to prevent the angle from being broken away in being set. A similar projection is likewise found on the abacus to prevent injury of the angle, when the architrave was placed upon it.

The contact surfaces of the uppermost adjusting drum and of the necking of the capital are not parallel to the upper surface of the lowest drum in the Parthenon; with a constant penetrating axis assumed mathematically, the two could not be in circles, and also no circular form was the basis of the annulets and echinus. On the eastern end, the differences in the [illegible] side lines of the adjusting drums vary as follows:--

From west to east sides, taking the columns from south to north.

0.533	0.620	0.551	0.533	0.562	-----	0.492	0.453	in.
0.315	0.289	0.207	0.114	0.045	0.249	0.232	0.533	in.

A fixed and uniform increase or diminution from the middle toward each side is as little to be based on these figures, as was found possible in the case of the lowest drums.

With the still large upper diameter of the columns, (3.77

to 3.87 ft.) and the slight differences in the side lines, only amounting to a small portion of an inch, i.e., with the slight divergence of the beds, the ellipse would actually differ very slightly from the circular form, had not a slight deflec-
102. tion of the axis of the upper drum solved the problem more simply, and as a matter of course, made the surfaces circles.

However perfected the execution of the masterpiece of Iktinos was and is still so in part, yet slight defects in workmanship slipped in, such as are shown in the unequal spaces between the columns, both above and below, the different dimensions of the abacuses of the different columns and the different heights of the columns, with the divergence of their axes, though as already indicated, some disturbances must be attibuted to the explosion of powder and the destructive bombardment, which the building suffered.

In spite of the slight practical value, that these given measurements have in regard to the general execution and for our judgement of the effect of the building, we must dwell on them somewhat longer for other reasons.

On the small Doric columns in the interior of the Tower of the Winds at Athens, another peculiarity is still to be noticed, which is not elsewhere found on Doric columns: the flutes are furnished with the so-called "pipes" (cabled ?) for a third of their height (upwards from the base). On the low monolithic and fluted, certainly not Doric columns of the two porticos of this monument, the flutes were lighter and better cut before setting; but to prevent injuries to the fillets and beds, the flutes were not completed at four points; the bosses between the fillets still remain visible at an inch or so above the floor (Fig. 77), which may have served for lifting them and for the use of the (crow bar.

71. Intercolumniations.

The distances of the columns from each other are in part determined by certain arrangements in the frieze; it is normal for the axis of the column to coincide with the middle of the triglyph, and so that from the axis of one column to that of the next, there are two metopes with a triglyph between them. If the metoper are now assumed to have equal widths and a triglyph be placed at the angle, it is no longer possible for the axis of the angle column and the middle of the triglyph to coincide;

therefore the intercolumniations between the angle column and those next adjoining it on the end and side depend on this arrangement, i.e., they must become less than the intercolumniations between all the other columns, which moreover, intentionally or unintentionally, do not always show equal distances
103, from centre to centre. Thus on the Parthenon, for example, this masterpiece of antique skill, the intercolumniations should be equal, but often vary as much as 2.16 ins., while the columns of Sicilian monuments are intentionally set with different intervals, so that the distances between the axes of the columns standing beneath the centre of the pediment are greater; the intercolumniations gradually increase from the angles to the centre in this case (Fig. 78).

These differences in the distances between the axes of the columns evidently produce similar ones in the metopes, so that the latter can no longer have exactly equal widths.

Vitruvius distinguishes five different modes of arranging the columns:--

1). The closely set mode (Pycnostylos): Intercolumniation equal to 1 1/2 diameters of the column.

2). The more extended arrangement (Systylos): 2 diameters.

3). The still more widely spaced arrangement (Diastylos): 3 diameters.

4). The excessively wide or distant arrangement (Aerostylos).

5). The arrangement with proper proportions (Eustylos): 2 1/4 diameters:- for the middle columns 3 diameters.

Our authority states in regard to 3), that the architrave breaks easily on account of the wide intercolumniations; that neither a stone nor a marble architrave could be employed in 4), but continuous wooden beams must be laid on the columns.

104, If we investigate the ratios of intervals to diameters of columns in Grecian monuments of the Doric order, the following values will be found for the given temples.

Monument.	Intercolumniation	Actual length architrave end to end.
1. Cadacchio.	2 3/5 low. diams.	7.48 ft.
2. Heraionin Olympia.	1 3/4	10.73
3. Selinus, Temple D.	1 3/5	14.37
4. Selinus, Temple C.	1 3/5	14.63
5. Egina.	1 3/5	8.53

6. Theseion.	1 3/5 low. diams.	8.56 ft.
7. Phigaleia.	1 1/3	9.06
8. Parthenon.	1 2/5	13.98
9. Corinth.	1 2/5	12.53
10. Selinus, Temple A.	1 1/4	9.81
11. Egesta.	1 1/5 to 1 1/6	13.88
12. Propyl. in Athens. Middle entrance.	2 3/5	17.81

Consequently, neither one of Vitruvius' appellations is applicable to any of these arrangements of columns; the numbers 1 1/2, 2, 2 1/4 or 3 not being found among those given.

One would give himself up to delusions (as shown by the given actual magnitudes of architraves), were he to judge of the actual length of the architrave extending from centre to centre of the columns from the numerical ratio of the diameter of the column to the interval between columns, without knowing the actual diameter of the column. The architraves of the Fountain-Sanctuary (Temple ?) in Cadacchio and of the Heraion in Olympia appear long in comparison with other temples, if one is ignorant of the actual distance between the axes of the columns or the magnitude of their diameter, and assumes a long architrave, and the use of the numerical ratio by itself led to the assumption in error, that with such "wide spacing" of the columns as in these two monuments, the architraves must have been of wood. This may possibly have been the case, but not by reason of the assumed wide spacing!

With equal distances between axes or length of architrave, an arrangement of columns may be Pyknostyle, Eustyle or Diastyle, while the bearing surface of the architrave is diminished or increased, and the diameters of the columns are correspondingly lessened or increased. (Fig. 79). The Eustyle arrangement may be quite bold and cause a very small strain on the architrave; merely compare the Temple in Cadacchio with the Propyleion in Athens; both monuments have the numerical ratio of 2 3/5, while the length of the one architrave exceeds that of the other by 10.34 ft.

It is also an error for one to assume that the architrave constructed of common limestone required a closer arrangement of the columns, and that the use of marble first permitted a wider

spacing. The Sicilian temples of limestone with a numerical ratio of 1 3/5 exhibit architraves with lengths averaging 14.44 ft., while Attic monuments of marble with ratios of 1 3/5 and 1 2/5 (Theseion and Parthenon) only show lengths of 8.56 and 15.98 ft.

72. Columns and Cella.

According to the arrangement of the columns about the cella, Vitruvius distinguishes between the following appellations:--

105. a. Arrangement in antis (Naos en parastasin) or Antae-temple, if the end wall of the temple is changed so that two culmns stand between two antae.[74]

Note 74. Antae in Latin = parastades in Greek.

b. Prostyle, if another row of columns is placed at a certain distance in front of the antae and columns of the antae-temple, and these are connected by an entablature continued on the right and left on the walls of the cella.

c. Amphiprostyle, if the same arrangement as in b is found in front of both pediment walls.

d. Peripteral, when the cella is surrounded by columns with 6 at each end and 11 at each side, including the angle columns.

e. Pseudodiptera, if 8 columns stand at each end and 15 at each side, yet so that the walls of the cella must correspond to the third column from the angle, and also that entirely around it a distance of two intervals between columns and one diameter of a column remains between the wall and the colonnade.

f. Dipteral, if 8 columns are at each end and double colonnades extend entirely around.

g. Pseudoperipteral, if the walls of the temple are inserted in the intervals between columns and the area of the portico is raised and added to the cella, which thereby experiences a material enlargement.

The given number of columns, arranged in the proportion of 6 to 11 or 8 to 15 (breadth to length) is retained in the least number of monuments; a tolerably great variety prevails here; the true number is not even invariably retained at the end, as the subjoined examples show:--

Metroon in Olympia	6 to 11
Fountain-Sanctuary in Cadaccnic	6 to 12
Temple on Egina	6 to 12
Temple of Zeus in Olympia	6 to 13 ,

Theseion in Athens	6 to 13
Temple in Nemea	6 to 13
Temple of Hera in Akragas	6 to 13
Temple D in Selinus	6 to 13
Temple A in Selinus	6 to 14
Temple in Egesta	6 to 14
Temple of Poseidon in Paestum	6 to 14
Temple S in Selinus	6 to 14
Temple of Athena in Syracuse	6 to 14
Temple in Phigaleia	6 to 15
Temple F in Selinus	6 to 15
Temple of Hercules in Akragas	6 to 15
Heraion in Olympia	6 to 16
Temple of Zeus in Selinus	6 to 16
Temple C in Selinus	6 to 17
Artemesion in Syracuse	6 to 18
Temple of Zeus in Akragas	7 to 14
Parthenon in Athens	8 to 17

106. 9). Antae.

78. Form.

The Antae (parastades or wall-end-piers) give the necessary architectural ending to the side walls of the cella, extended beyond the transverse walls, as bordering bands, narrow or of the same width as the columns, and only slightly projecting from the plane of the wall; like the columns, their height is divided into three parts, also consisting of a Base, Shaft and Capital.

The antae are so formed in plan, that the projection outwards from the side wall of the cella corresponds to the full
107. thickness of a column, as in the pronaos of the Theseion, or it merely forms a band, very narrow in proportion to its height, as in the opisthodome of the same temple; on the side of the wall turned inward with columns between antae, the antae have a width equal or similar to the diameter of the columns (Compare Egina and Phigaleia); but with a colonnade placed in front, as in the Parthenon, all projection on this side is omitted. The front surface of the pier is in all cases but an inch or so wider than the thickness of this portion of the cella wall.

The antae are required to follow the inclination of the walls and columns (Fig. 80); they are also diminished like columns in

many cases and in a very strongly expressed way in the so-called Basilica in Paestum, less so and but a few inches in Phigaleia (3 and 3.59 ins) and on the Parthenon (4.61 ins).

On one of the temples in Selinus, the regular antae give place to a fluted three-quarter column, whose centre coincides with the centre of the wall, a less skilful solution of the termination of a wall and unworthy of imitation (Fig. 80).

The base of the antae is in most cases only formed by the projecting lower ashlar course. and it accordingly receives the same treatment as the lower part of the wall itself. with a richer treatment of that, a lower base is used (reverse ogee with narrow band), returned around as on the Theseion.

The surfaces of the antae remain absolutely plain and without ornament; only the fine bed joints of the courses of stone intersect them, beint continuous with the joints of the end walls.

The capital is somewhat heavily treated in the older Sicilian temples; the uppermost course slightly projects beyond the surfaces of the antae and is decorated by a recurved leaf-moulding with a thin abacus above it; on the buildings of the perfected style, fillets or narrow bands below the projecting leaves are added to this profile, and a delicate crowning moulding is added to the abacus. The ornaments of the different portions were not sculptured in relief, but were merely painted on them. (Fig. 80).

A peculiarly archaic and heavy treatment is shown by the antae capitals of Paestum, while those of Phigaleia exhibit the most aspiring and freest forms (Fig. 80).

The antae on the Heraion in Olympia were made of wood, since the upper portions of the walls of the cella indeed consisted of unburnt bricks, which required especial protection at a free ending. Arrangements on the floor and the lower courses of ashlars (Figs. 81, 82) afford assured evidence of this. Anchor holes are cut in the thresholds and double dovetail grooves are cut in the lower ashlar course to receive inserted strips to hold the board wainscoting and protect it from injury. (Grooved-in cleats, such as we have in our drawing boards and table tops, were already known to the ancient Egyptian joiners, as shown by some small wooden chests in the Gizeh Museum at Cairo. Also see the succeeding volume of this Handbuch, Fig. 205, p. 227). The

vertical grooves in the stone are further undercut in order to prevent the loosening of the protecting boards.

The form of the stone antae as narrow wall strips is indeed connected with a reminiscence of the ancient construction in wood, from the period in which the mixed mode of building in masonry and wood was in use.

The primitive form of the commended antae capital at Paes-
108 tum is also to be found on ancient rectangular steles. The cymatium (ogee moulding) first occurs on the works of the later time and of the best period, and its invention dates back to the 7 th Century B. C., according to Puchstein (p. 52, 53), (between the building of the Treasury of the Geloans and that
181 of the great Temple on Selinus). It first occurs on clay objects and in architecture on the wooden and stone members covered with terra cotta (Metapontum, Olympia, Syracuse, Selinus), and thence finds its way into stone architecture.

10). Architrave.

74. External Form.

The Architrave (epistyle or under beam) spans between the columns and consists of massive blocks of stone, rectangular
109 or square in section, which extend from centre to centre of the columns; they repeat the form of the building already given in the stylobate, receive the load of the frieze, cornice, and ceiling lying above them, as well as a portion of the weight of the roof, and transmit the entire loading to the powerful columns that oppose it.

75. Decoration.

Only in small monuments are the architraves cut from solid blocks; 2 or 3 are placed side by side in larger ones. No decoration of any kind can any longer be traced on their under surfaces; merely the one or two fine lines of the joint between them occasionally appear in the marble monuments, while in stuccoed or polychrome architecture, these also disappeared beneath the coating of stucco.

According to the example of the decoration of Roman architraves, where older models were certainly imitated, the under surfaces may have been ornamented by painted bands, interlaced bands, etc.

The front surface is now simple and plain on most temples and must originally have not been so void of ornament as is repeat-

edly assumed; but least of all should this be considered as a part excluding decoration.

The Temple in Assos had representations in relief on the front surface of the architrave containing numerous figures; Sicilian terra cotta cornices exhibit continuous scroll ornaments there and horizontal stripes with sea waves; even the architrave of the Parthenon received its metallic decorations at the pediment end, although perhaps only in the time of Alexander, the golden shields beneath the metopes with the inscriptions between them; the iron pins forming a triangle on the side architraves of this sanctuary are continually repeated and permit a further decoration to be inferred (Fig. 68).

Pausanias says of the Temple in Delphi: "Golden weapons hang on the architrave; the shields were dedicated by the Athenians for the Battle of Marathon, and the weapons on the rear and the left side by the Aetolians, especially as the weapons of the Galatians. They very closely approach rectangular Persian shields in their form". Also at the Temple of Zeus in Olympia, he saw "21 golden shields, gifts of Mummius, on the external architrave extending around above the columns".

Of the last, the German expedition only found on the "Metope blocks" of the eastern front, circular surfaces free from stucco and with holes for dowells and strips of copper, and accordingly correctly assumed in the reconstruction of the temple facade, that the architrave was without ornamentation.

76. Upper Termination.

The outer surface of the architrave is ornamented at top by an abacus member or projecting band, and suspended from this at certain intervals are regulas with or without the so-called drops, small cylindrical or conical forms. One such regula corresponds to each triglyph in the frieze. The band was usually made perfectly plain and only received painted ornamentation, for example, a fret pattern as on the Parthenon; or it consisted of a round between two fillets on older monuments, as on one temple in Selinus; it gave place to a leaf or egg-and-dart moulding with a lower band on the Temple of Demeter in Paestum. The regulas are only recessed but little in the best period, being in section rectangular fillets extending the width of the tri-
110. glyphs,[77] while they are trapezoidal in section on older monu-
111, ments (Assos), or are somewhat curved on the front surface (Se-

linus, Fig. 84). On the Parthenon, they were decorated by a painted palm-leaf ornamentation turned downwards, and were therefore characterized as a suspended decoration.

Note 77. On the older great Temple on the Acropolis of Athens, as shown by the fragments in the wall of Cimon, the regulas with drops were somewhat wider than the triglyphs.

On the Temple in Assos, these regulas are left without any further appendages; on the so-called Tomb of Absalom, they bear 4 suspended knobs or drops; there were 5 of these on the Buleuterion at Olympia, and generally 6 on the monuments of the best period.

The drops differ but little from the cylindrical form in most cases, and therefore diminish but slightly (Parthenon, Theseion), or they are perfectly cylindrical (Selinus); their greatest circumference touches the architrave, or they hang free (Fig. 84).

These regulas and drops are usually preparatory to the triglyphs and are regarded as belonging with them, as organically necessary; but they also occur on the architraves of the side walls and on colonnades in the interior of the temple. At the same distances as on the architrave, they are suspended beneath the figure frieze of the Parthenon, above and between the columns of the central aisle of the Temple on Egina, and also beneath the entirely plain external frieze of the cella of the same temple. In the last case, the significance and preparatory function of a certain architectural member ends in a definitely different purpose; but the regulas must or may recall the primitive forms of the frieze and points out the deception, that occurs here.

77. Internal Surface of the Architrave.

The inner surface of the architrave exhibits a simpler treatment. It is either quite plainly treated, as on the Parthenon and the Temple of Zeus in Olympia; it projects somewhat beyond the frieze on the first named monument; it lies in the same plane with it on the latter, and after covering the joints and divisions of the frieze with a coating of stucco, it represents a single great surface extending to the moulded course supporting the ceiling beams. Or the inner surface is merely crowned by a narrow border (fillet or ogee) without further accessories

(Compare Propyleon and Theseion at Athens). Only on the Temple of Nemesis at Rhamnus are regulas and drops described on the inner surface of the architrave also, above which is a plain frieze, crowned at top by a broad band.

78. Construction.

The blocks composing the architrave in marble monuments usually have equal widths; in those of porous limestone, which received a coating of stucco, they frequently differ in size, so that on the Temple of Zeus in Olympia, for example, the three architrave blocks placed side by side measure 2.58, 1.67, and 2.33 ft. in width.

The separate blocks only touch each other along narrow borders about 2.36 ins. high, the remainder of the surface of the joint being roughly pointed back, and frequently so much, that the space between two blocks is often 9.45 ins. at the centre. (Compare Propyleon at Athens). The bearing strength was not lessened by this stone-cutting, but a more accurate and finer joint was made possible.more easily.

The height is also divided in courses for the architraves of the gigantic Temple in Akragas[78] and for an entablature found on the Street of the Treasuries at Olympia; the separate courses have the considerable height of 3.94 and 3.28 ft. in the first case, while they are but 1.10 ft. high in the second, with a width of 2.26 ft. (Fig. 85).

Note 78. Bittorf, Taf. 89 and p. 309, found square grooves on the under surface of the lowest architrave blocks, which extended beyond the greatest projections of the capitals. He believes that marks of rust were discovered in these grooves, and concludes from this that iron bars were inserted in them, since the stone alone was not in condition to support the stones lying thereon.

The stones of the Olympian entablature only touch on margins of the horizontal bed surfaces, so that the beds of the separate blocks are barely covered at the margins. On the Temple of Demeter at Paestum, the crowing ogee moulding is not cut on the same block as the architrave, but on separate stones, laid on the other. The external architrave blocks abut against each other at a right angle; the internal ones join obliquely, being mitered at 45°. (Compare Fig. B;, also Egina and Olympia).

The separate blocks are carefully held together at the abutting joints by iron I-cramps set in cast lead (like the stones of the cella walls); they generally rest freely on the columns without the use of any means of fixing them.

113. The greatest strain on the architrave beams may perhaps actually occur on the blocks over the middle passage of the Propyleion in Athens. This architrave consists of two parts and is 17.82 ft. long, its width is 2 × 2.36 = 4.72 ft, and its height is 3.77 ft.; so that it has a sectional area of 17.83 sq. ft. The volume of the frieze, cornice, tympanum and pediment cornice amounts to (4.72 × 17.82 × 13.48 ft. high)= 1133.7 cu. ft., one cu. ft. of marble being taken as weighing 168.55 lbs., which gives 191,150 lbs. as the loading of the architrave, that has at each end a bearing of about 24 ins.

In the older temples with a mixed system of construction, and on those having enclosing walls of unburnt bricks, the architraves and the ceiling beams above them were certainly of wood. The lack of all parts of the cornice in many ancient temple structures on the one hand, and the peculiarities of the known material of the wall on the other, as well as the written evidence, make this tolerably certain. The supports of the architrave outside the cella walls may likewise have consisted of wooden posts; but these may also have been replaced by stone pillars.

The form of such a wooden architrave was indeed the simplest imaginable, as required by the statical function of this architectural member. Their dimensions were suitable for the pillars, and so long as wood was used, practical dimensions were not abandoned.

But with the acceptance of Egyptian stone columns must occur a change in the entablature, whose primitive arrangement we have seen in the Lycian rock-cut tombs (Fig. 86). The dimensions of the timbers must then become proportional to the columns, and instead of beams or borders (see Fig. 86; by referring to Fig. 86, it is not stated that we believe the rock-cut tomb to be very ancient, but indeed that a very ancient wooden architecture is imitated in it) and of the closely placed round timbers, strong girders of a single piece or of rectangular beams laid on each other were employed. The terrace roof or

convex clay roof, as we have seen it on the architecture of the Francois vase, was succeeded by the gable roof, that as we will explain later, might continue to be a kind of clay roof. (Fig. 87). From the diameter of the columns was then developed or deduced the size of the entablature, and if it were desired to increase the magnitude of the temple, wood must be entirely abandoned, unless something mean were to be created.

The external form of the wooden construction and of its covering by terra cotta then affected the motive for the stone architecture of the entablature (architrave, frieze, and cornice) with its severe and harmonious decoration.

11) Triglyph Frieze.

79. External Form.

If the architrave formed the first connection of column to column, if it was the supporting beam for the parts lying above it, then in this sense it must have first received the ceiling beams of the temple and its porticos. This succession of the
115, structural parts was retained in Ionic stone monuments, but not in Doric. The ceilings of the external porticos in the latter, in the still preserved stone monuments of the best period are, or were composed of coffered slabs arranged side by side(Parthenon), or of separate stone beams with coffered slabs laid between them (Theseion), but which in both cases rested directly on the frieze, and not on the architrave.

While the Ionic system of construction entirely concealed the anciant wooden construction in the later stone construction and obliterated in different buildings all reminiscences thereof in respect to forms in the frieze and cornice (for the dentils also disappeared; see Erectheion, Nike Apteros), on the contrary, its arrangements were retained in the interior and were accurately imitated in stone: the Doric system of construction had given up the imitation of the ancient wooden construction in the interior and had abandoned the reminiscences thereof on the exterior of the building, -- in the frieze and in the cornice. These were the ends of the beams and the closing boards between them with their projecting cleats and fastenings, the triglyphs, metopes, taenia, and regulas with drops!

The peculiarly and energetically subdivided frieze rests on the architrave, and it is one of the most decisively expressed and

characteristic indications of the Doric style and shows on its exterior at fixed intervals narrow vertical blocks of stone with channels and chamfers--triglyphs--, which are decorated at top by a head-band, that shows a slight projection on its front side only. The intervals are in many cases closed by slabs, plain or decorated by figure reliefs, usually appearing square externally, or in other cases by solid blocks--metopes--, which have a head-band at top somewhat lower than that borne by the triglyphs.

The triglyphs are regarded by Bötticher and others as "short pillars"for supporting"the cornice lying above them, as jambs of windows for light, of the originally open interspaces, which had then served for lighting the cell; that they also originally further concealed behind them the subdivision of the ceiling of the room, and consequently stood free on three sides, and only when no windows were required,did they receive on both sides the slabs that closed their interspaces. The vertical grooves were cut on the three free surfaces, and therefore, "since they were grooved on three sides". -- they received the name of triglyph. Others accept the grooves on the front surface only and count two full channels with a half channel on each angle as three grooves--triglyph.

The "originally"open space between the triglyphs is usually based on the passage from the Iphigenia in Tauris of Euripides (verse 113) (year of first performance probably 414 B.C.), which runs in the manuscript:--

"Ora de g'eiso triglyphon opoi kenon"
"Demos kathenoi---.

Which translated verbatim is (since eiso signifies in, into):. "But look in the triglyphs, where (perhaps) is a free space to lower the body down"---, and which certainly does not make much sense. Another mode of writing is :- "Ora de g', eiso--". "But look to it whether within the triglyph may be an empty space--". This meets with the same fate. The words are held by philologists
116. to be corrupt, because Blomfield prefers to read "geisa" instead of "g'eiso", and Nauck conjectures "chreon" instead of "kenon". Besides, "opou" and "eipon" are suggested for "opoi". Therefore all the words are doubtful with the exception of the blameless "triglyphon". Consequently, not much is proved by this verse.

Moreover, Euripides describes a barbaric-heroic arrangement, which must have occurred more than five hundred years previous to his time. Nominally born on the day of the Battle of Salamis, he was acquainted by personal examination only with the temples that originated after the Persian war; whatever temples of an earlier era remained in existence outside the mother country and could be known to him by report, indeed preceded the creative period of the poet by 150 years, but even on these monuments lying nearer the heroic era, we find no Doric frieze with window openings, and with gifts and vessels placed therein.

Viollet-le-Duc indeed also assumes that in the oldest buildings the triglyphs were stone blocks, which were required to support the cornice while the metopes remained void; he desires to consider the channels on the triglyphs as characterizing the latter as supports, while his countrymen De Saulcy and Prisse d'Avennes are of another opinion and renounce the structural significance of the component parts of the frieze. Semper likewise says that the Triglyph-and-metope frieze originally had nothing in common with the construction, but that it was probably an indented border representing a margin and was of textile origin. "The Doric style employs in the triglyph a symbol, which with some probability may be referred to this border-termination appertaining to the nature of clothing and the textile art. In this case, the triglyph would form a curtain and appear as an indication of the internal ceiling (the Pteron). In a similar manner. J. Braun assumes them to be the suspended flaps of a heavy decorative ceiling, which are separated from each other by portions of equal size cut out (metopes), and are firmly held by a common band stretched over their lower ends, below which appear the drops.

The metopes were indeed always intended to receive figure sculptures, ornamentation either painted or executed in relief; either a palm ornament developing itself outwards from the centre of the field, or a representation of figures. The latter then generally exhibits an episode of a combat or particular deeds of certain gods or heroes, or they express animated battle scenes, or scenes with a quiet and peaceful meaning. The decoration of the frieze by a continuous composition full of meaning and completed, was not intended, but only the representation of small scenes with usually but two figures, on which was based the separation by architectural members.

80. Triglyphs.

Moved back into the same plane as the front of the architrave, the triglyphs of the Parthenon stand as small upright aspiring pillars, whose front surfaces and a small portion of their side surfaces were first dressed smooth, while the portions lying within the frieze only show the quarry working. The front surface was decorated by two channels of triangular section rising from the architrave almost to the head-band; they terminate almost horizontally at top, the angles being merely somewhat rounded off. The rear angle of the channel is carried up higher
117. than the front angles lying in the surface; a strong under cutting (Scotia ?) is therefore found at the end of the channel for producing a more animated effect of shadow there. The angles of the pillar are chamfered; the chamfered surfaces are parallel to those of the channels and likewise terminate with a deeper, cavetto-like undercutting like a suspended knob, also forming a part of the rectangular edge (Fig. 88). A narrow head-band is dressed smooth and projects only on the front side and crowns the pillar, while a delicate beaded astragal borders this in front and on the sides, where it joins the projecting cornice, therefore being above the head-band (Parthenon). A similar treatment is shown by the other Doric monuments of the age of Pericles, except that the crowning beaded astragal is wanting on the Theseion; it gives place to an echinus bead on the Propyleion at Athens.

118. In the older temples, this uppermost delicate ornament is entirely wanting; the plain head-band usually abuts against the under surface of the cornice; therefore narrow fillets are often inserted between the head-band and the surfaces of the channels, as in Selinus and Paestum, or half-round beads, as on the second Temple in Selinus, which moreover only extends on the front surfaces. In Paestum and Selinus, the channels terminate in pointed or ogee arched forms without undercutting, or they are furnished with cushion-like undercuttings; others terminate in form of segmental, oval, or even semicircular arches, as in Akrai, the end being even bordered and characterized by palm ornaments; still others terminate horizontally in a dry manner, and instead of an undercutting, have an ineffective sloping triangular channel surface. On one Temple in Selinus, the surfaces between the

channels are also moulded, being rounded and bordered by two fillets (Fig. 88 b); the channels are bordered on the terra cottas of Akrai. Other fragments from Akrai and a painted frieze from a tomb at Cyrene show the head-bands of metopes and triglyphs worked in a common plane, -- examples from an early time, where a structural idea is not anywhere expressed in the construction of the frieze. Triglyphs in Eleusis, which belong to the latest period, also in a very peculiar way exhibit emblems on their front surfaces, besides the channels(See the adjacent colored Plate).

The triglyphs on the second Temple in Metapont are 2.2 ft. wide, are peculiar, and mere fragments of them have been preserved. The channels are composed of two quadrants, separated from each other by a groove at the back; the spaces between them are 3.61 ins. wide and are made concave with a fillet.56 in. wide at the middle (Fig. 89).

As the very numerous vestiges on limestone triglyphs coated with stucco and on those of marble still show, the entire surfaces were covered by a rich blue, only the head-band receiving an additional ornamentad design, rings connected by oblique lines, as in Akrai, or perhaps also an ascending anthemion ornament. On the monuments decorated by sculptured metopes, the triglyph
119. blocks received rectangular grooves on both sides for inserting the sculptured slabs, and to afford these the necessary support; on other monuments, where this was not the case, they are worought on the same blocks as the metopes, or even two of them and three metopes are in one piece, as is the case in the Propyleion in Athens, which comes from the best period, and in other places.

On the Temple of Demeter in Paestum, the plain metopes form a continuous slab in which the triglyphs are inserted (Fig. 90).

The latter were chiefly held in place by the projecting covering cornice; this has now entirely fallen, and the triglyphs were compelled to follow it, not being fixed. Only the recesses which they formerly occupied are now to be seen in the great metope slabs.

81. Metopes.

On the Temple with the ancient sculptures in Selinus, the spaces between the triglyphs are first formed in shallow recesses, enclosed by a sill resting on the architrave, by two narrow jambs

and a lintel slightly projecting beyond them; the rear surface is formed by a plain vertical slab from which rise sculptures executed in high relief representing the deeds of Hercules, of Perseus, etc. (Fig. 91).

The treatment of the metopes on other monuments differs from this. They usually consist of a slab decorated by sculptures, or a plain inserted block, which might be decorated by painted ornaments, as shown by Fig. 88; the slab is ornamented at top by a narrow border, which consists of a simple band, (Compare most Sicilian temples, the Theseion, etc.) or of a band with a crowning beaded astragal (Compare the Parthenon), or of a band with an echinus moulding (Compare Propyleion at Athens), or is replaced by a group of mouldings (as at Phigaleia, Fig. 91).

Color was further added here as an enrichment, since the figures gleamed with the vivid colors of life and stood out from a dark or light ground; the head-bands were also decorated by a fret pattern or by a border ornament.

The construction of the metopes with thin slabs, as on the
20 Parthenon and Theseion, must then have only occurred when they were intended to receive sculptured figure ornamentation. Simple and practical reasons favor such a procedure; these thin slabs were more convenient for the sculptur; he could master his problem with greater freedom from care, and the danger of injury to the sculptures by the stone-cutter and to the architectural portions by the sculptur were best avoided, because in this way, none of the work of one came into the hands of the other, and both were not compelled to work together or successively on the same block of marble.

The slabs with figure ornamentation are more frequently composed of two materials; thus for example, on the beautiful metopes of a Temple in Selinus preserved in the Museum at Palermo, which belong to the best period, the naked portions of the figures, such as the face, hands, arms and feet, are of white marble, while the bodies of the figures and the draperies are composed of the ordinary porous limestone, of the same piece with the slab itself, and were once coated with stucco and color.

On the fragment of a frieze in Epidauros, the triglyph and two metopes are cut in one piece, the latter being decorated by a rosette in relief (Fig. 92). Similar ornaments were also found in Eleusis, and on the Temple of Zeus in Olympia the met-

metopes were ornamented by round metal shields.

The plain metopes are mostly constructed of blocks, which extend more than half the thickness of the architrave and are sometimes arranged to abut between the triglyphs, or the triglyphs overlap a little to conceal the joint.(Compare the construction of Sicilian temples). The surfaces of the metopes always lie somewhat behind the front surface of the architrave.

/2/. The treatment of the triglyphs and metopes is therefore shown to be as diverse on the different monuments, as is the mode of construction of the entire frieze.

82. Inner Surface of the Frieze.

As little as the architrave exhibited the same treatment of forms on the side turned towards the cella wall, as that on the surface turned towards the person looking at the sanctuary, just as little do we find in case of the frieze the same treatment inside and outside.

The division of the frieze into triglyphs and metopes is omitted on the inner side. Above the architrave, either in the same plane with it or set somewhat behind this (as on the Parthenon), rises a plain continuous frieze crowned by special mouldings on which first rests the ceiling of the portico. these plain inner frieze-beams often occupy half the thickness of the frieze, or if sculptured metopes are intended, something more than one-third of it. In monuments constructed of limestone, as in Sicily, on Egina, and in Phigaleia, the separate portions of the frieze mostly touch inside, while on the Parthenon, interspaces of 7.87 to 9.84 insa lie between them; the blocks are then held together by iron I-cramps set in cast lead; just behind the sculptured metope slabs are rough blocks as large as the triglyphs and connected with them by one or two I-cramps of iron; the blocks are vertically connected with the architrave and the crowning cornice by iron dowells. The same solid and careful mode of construction, as in the masonry of the cell, is also shown between the parts of the cornice. The front, inner and outer surfaces of the frieze are not vertical in the Parthenon, but are likewise built inclined, following the inclination of the columns and cella walls; the entire surface of the entablature from the lower edge of the architrave to the projecting cornice therefore lies in an inclined plane.

The projecting cornice slabs then most commonly bind together all the stones belonging to the frieze and rest upon them. They are composed of proportionally narrow through blocks, which are usually somewhat wider than the triglyphs and narrower than the metopes (Compare Fig. 93, also Egesta, etc.), and both rest on the metope blocks and also on the triglyphs. Hence the repeatedly stated law, "that the metopes never were supporting members, and that the burden of the cornice-margin of the roof was borne by the triglyphs alone, which originally received the ceiling beams behind them", is not demonstrated by the construction of a single monument.

The different treatment of the frieze on its two sides already does not permit the idea of considering the triglyphs as supp-
122 orts and the metopes as openings to prevail; the assumption that the weight of the cornice was transmitted through the triglyphs to certain points of the architrave is also found incorrect. In most of the executed constructions described, the loading of the architrave is nearly uniform. If the triglyph-pillars were intended as supports, they should at least be so wrought as to extend through the entire depth of the frieze. If the metopes contribute to lighten the load of the architrave, then the spaces between the triglyphs should only be closed by thin slabs, both outside and inside; the intervening space should be void; the cornice slab should only touch the triglyphs, and ought therefore to extend over one-half or the entire length of the architrave. But these requirements are nowhere satisfied.

Notwithstanding this, if one desires to retain his belief in an originally structural significance of the triglyphs and metopes, he must admit that in the best period of Grecian architecture and even two centuries earlier, the understanding of this idea had already become extinct.

In regard to the treatment of the cella wall, it has already been intimated, that at the ends of a few monuments occurs a transference of the triglyph-frieze to this wall; yet this only takes place where the opening of the doorway in the end wall is enlarged to a colonnade-in-antis.

The Temple in Phigaleia, the three Temples F, D and S at Selinus, as well as the Temple of Zeus in Olympia, had this transferred triglyph-frieze (the latter over the antae-arrangement

of the pronaos and posticum), but it always ended with a peculiar return at the angle and never was continued along the sides or above the solid wall of the cella (Fig. 94). The Temple S had a second colonnade; the architrave belonging to this was
123, continued above it to the architrave of the external colonnade, and consequently the inner triglyph-frieze over this entirely disappeared, an end triglyph abutting against the plain inner frieze of the peristyle.

The circumstance must always remain singular, that the continuance of the triglyph-frieze along the solid walls of the cella was always avoided. If the cella not surrounded by columns was the most ancient form of temple, and if the metopes were window openings for lighting the interior, some reminiscences of such an arrangement must have been found on the side walls of the cella in the earliest examples. But such are nowhere met with, while even in the little so-called antae-temples, the triglyph-frieze on the pidiment ends is generally omitted on the sides. The passage in Euripides, which had moreover to be rejected on philological grounds, therefore loses all importance, even if one supplies "between the triglyphs". Were openings assumed, no one could reach the interior of the cella by getting in through the triglyphs, either in case of a peripteral or of an antae-temple. Only on sepulchral monuments or on secular structures, as on the Athenian Propyleion, do triglyphs occur above a solid wall.

83. Other Forms of Frieze.

But the triglyph-frieze is also omitted above the architraves of the pronaos and posticum, giving place to a perfectly plain frieze, as on the Temple at Egina, or the divisions between the figure reliefs disappear and a continuous composition occurs in place of the small separate scenes, as on the Theseion in Athens (Fig. 95), and in the most perfect manner on the Parthenon (Fig. 94). The same case is found in the posti-
124 cum of the former as on Temple S in Selinus, the architrave and the frieze extending from one side colonnade to the other, while in the pronaos, the frieze only extends across the width of the cella and terminates at the sides in a plain return. The figure frieze on the Parthenon, which occurs in place of the triglyphs, extends around the entire cella structure. On the

Temple on Egina, the regulas and drops suspended beneath the plain and figure frieze recall the triglyphs, which could not be employed in the great figure composition of Phidias. a more correct feeling omits the regulas and drops beneath the figure frieze on the Theseion; the plain architrave band gives place to a richly moulded border, composed of fillet, ogee and half-round.

The separated and different frieze decorations on the Parthenon and Theseion are found on the Doric Treasury of the Megareans in Olympia combined in the same surrounding frieze; the triglyph-frieze alternates in this with continuous figure compositions, so that the former decorates the ends, and the adjacent sides are ornamented by the latter.

The figures of the continuous frieze were also colored, as well as those of the metopes on the colored Plate opposite p. 118, which indeed rose from a dark back-ground.[81]

Note 81. On the reliefs of the Macedonian royal sarcophagus in the Museum at Constantinople, the ground from which the colored reliefs rose, remained white.

Without reference to their elevated position and the location of the observer, the small figures of the frieze and metopes were designed and executed as if for direct view. The figures of the metopes of the Parthenon average 3.28 ft. in height and require the observer to be at least 50 ft. distant from the building in order to see the entire back-ground; a line of sight of at least 70 ft. being thus conjectured. The figures of the frieze of the cella are about 2.72 ft. high, and they may either (certainly with considerable foreshortening) be seen from the uppermost step of the stylobate, the line of sight then making an angle of 60° with a horizontal at the side of the cella and having a length of 40 ft.; the greatest distance from the building that can be assumed and also at its side, without some portion of the frieze being concealed by the lower edge of the architrave, gives an angle of 40° between the line of sight and a horizontal with a length of 75 ft. for the visual ray.

84. Subdivision of the Frieze.

The distribution of the triglyphs on the frieze is then such that one comes above each column and one over each interval,

the centres of the columns and triglyphs coinciding in one case and those of the interspaces and triglyphs in the other; an exception is only made in case of the angle column, since a triglyph always forms the angle of the frieze. The triglyphs and metopes usually have eoual widths among themselves; if these are to be retained and carried out in the frieze, the mode of arranging the columns will necessarily depond on the subdivision of the frieze. Under this assumption and with the use of an angle triglyph, there must be a smaller interval between the angle and second columns, than between the second and third or third and fourth (Fig. 96).

If the uneoual intervals between the columns resulting therefrom are to be avoided, only two methods exist; to make the metopes next the angle, or these and the next succeding ones, wider than the others, or to give up the angle triglyph, the latter being usually preferred in Roman art and in that of the Renaissance, in order to make eoual distances of the columns from each other possible and to produce no disturbance in the frieze.

On Sicilian mounments, as already mentioned, where the intercolumniations are all different, i.e., increase towards the centre, it is self-evident that the metopes are likewise of different sizes; differences in dimensions also occur at the Parthenon, produced by inaccuracies in the arrangement of the columns and in the execution; for the same reason, the regulas and drops are not always exactly beneath the triglyphs. For example, the the second on the eastern side, counting from the south-east angle, is displaced about 5/32 in. These petty irregularities in the Attic masterpiece must not be confounded with the intentional ones on Sicilian monuments.

Three solutions are then possible in the treatment of the frieze.

1. Metopes and triglyphs eoual among themselves, using the angle triglyph, then uneoual intercolumniations.

2. Triglyphs eoual, but metopes nearest the angle larger, retaining the angle triglyph, then with eoual intercolumniations.

3. Metopes and triglyphs each eoual among themselves, with eoual intercolumniations, the angle triglyph then given up, a half metope being employed at the angle.

The last solution is not carried out on any Grecian monument; it was indeed assumed for the Temple of Demeter in Paestum by

Delagardette; but I may doubt its correctness.

Vitruvius terms the solution defective "whether made by lengthening the metopes or reducing the intercolumniations", and it results from this that the ancients had in the course of time avoided the use of the Doric order in their temples. With the abundance of Doric monuments, which originated in the best period and were still built until the period of decline, this principle of Vitruvius appears somewhat singular; Vitruvius indeed quotes the evidence of some ancient architects, of Tarchesios (otherwise unknown), of Pythios (builder of the Temple of Athene of Priene), and of Hermogenes (builder of the Temple of Artemis of Magnesia), as saying that on account of the defective and inharmonious proportions of the members, no more great temples of the Doric order should be built.

The normal distribution of the triglyphs shown as being usual for Grecian Doric temples with closely set columns, Vitruvius designates as "monotriglyphic", i.e., with one triglyph above each intercolumniation (Book IV, Chap.3), in contrast to those with two or three triglyphs for each intercolumniation of buildings with widely spaced columns (Compare the central passage of the Propyleion, and that of the Market Gate at Athens).

Since the marks of the derivation of the triglyph frieze on existing stone monuments from any other mode of construction were lost in consequence of the change of the ceiling of the portico, and the frieze thereby became already in the earliest period of the stone temple merely an ornamental accessory, there remains for its explanation only the assumption, that histori-
127. cal traditions and recollections of an architecture, that disappeared long since, may be preserved in it, for otherwise its function in the building cannot be explained.[82]

Note 82. Finally, how little the original connection between the structural and ornamental form of the Doric frieze may be understood is proved by the arrangement of the triglyph-frieze on the Arsenal of Philo, with which are then contrasted the two story Stoas in Athens and Pergamon.

If we adhere to the wooden theory, then according to what has been already stated, Dieulafoy (p. 66) in stating that the triglyphs are wider or enlarged dentils (these being explained as the ends of beams, as visible on Lycian rock-cut tombs),

whose dimensions were fixed by the size of the transverse beams, which again depended upon the weight of the roof and of the covering material. The triglyph frieze is then the changed form of the dentils (See Goller, p.78), and the use of the one decoration excludes that of the other on the same building. And yet we find SCompare Figs. 5,6) a triglyph frieze and dentils above each other on truly ancient terca cottas from lower Italy and Sicily! The late period indeed does the same (Compare Pergamon and other places); still we ought not to take this into account.

In explanation of the triglyph frieze, Vitruvius (Chap. II-4) says:- "if one be of the opinion that where triglyphs are now found, there were openings for light, one should for the same reasons believe also that the dentils in Ionic buildings have taken the place of windows. For the intervals on both sides, both between the dentils and also between the triglyphs, were termed "metopes"; for the Greeks call the places of beams and poles "opai", as our countrymen call these holes "dove-holes" (columbaria). Thus the intervals between beams, which are found between two of their positions (opai) is termed "metope" by them.

Hence the opai are holes in the masonry for beams, or in modern language, "holes for through beams", but in wooden construction are the places at which the ceiling beams rest on the architrave.

128. Therefore in one case the metope is a piece of masonry between two holes for beams, and in the other it is the open space betwee two ends of beams, to be filled later, but neither in the completed stone or wooden framed construction is it a hole or a small window.

According to the usage of the Grecian language, the word "metepon" denotes the part over the root of the nose and between the eyes, thus a solid body, a division between two openings. It is used in this sense in the building contract for the Arsenal near Zea[85] (contract of Enthydomos, son of Demetrios of Miletus, and of Philon, son of Exekestes of Eleusis, for the erection of an arsenal near Zea) for there "metopon" signifies a strong pier or door-jamb, especially the mullion at the centre of a double doorway, a division between two openings.

Note 85. Corpus Inscr. Att. II; 2, No. 1054, lines 22-26. Berl.

The passage in question runs thus in the original (See Durm). Two translations or interpretations of this lie before us, one by Choisy[86], and the other by Bohn[87].

Note 86. Choisy, A. Etudes sur l'Architecture grecque. Ire Etude; L'Arsenal du Piree. Paris 1883. Also Fabricius in Hermes 1882, p. 570.

Note 87. In Centralblatt d. Bauverw. 1882. p. 296.

From Choisy.."reserving on the width of the arsenal doors to the number of two on each side; width nine ft. And on each side between the two doors, build a dividing mullion having a width of two ft. and set ten ft. toward the interior. And carry to the first pillars the wall, against which opens each of the two doors".

From Bohn...."but openings for doors at the ends are to be left, two of those at each end, nine ft. wide. But on both sides shall a space (metopon) be arranged between the doors (their walls ?) two ft. wide, but to project inward ten ft., the wall shall bend around to the first columns, and also each one of the leaves of the doors to open against it".

Choisy's interpretation is correct and that of Bohn is not; the point will become most easily understood by the sketch in Fig. 97 according to Choisy's view, who should have more properly used the word "ouvertures" (openings of the doorways) instead of "portes". "Duraias" (openings for doors) seems to have been intentionally written the first time, and "duron" (doors) the second time. For only by means of the end wall inserted at the centre,-- the metopon-- were there two doors!

As in Vitruvius the metope is the piece of masonry between the holes for two beams, so is it also with the Athenians the strong dividing and supporting pillar between two openings for doors, and if Vitruvius excludes the assumption that the triglyphs were windows, according to him and to the preceding Grecian building contract, the metopes were still less window openings! Triglyphs are indeed mentioned twice in the contract of Philo; but they are never opposed to metopes.[88]

Note 88. "Metope" otherwise briefly signifies "face" or "front". "Metopon" and "metopou" are to be understood in this sense in the building contract for the Athenian Walls.(Corp.Inscr. Att. II, Berlin 1877, no. 167, lines 40, 66) There simply means "front".

In the building inscription of the Asklepeion [89] the structural parts above the columns do not receive the names otherwise current, but:--

129. The architrave is designated by "to stroma".

The frieze by "poistasis"(what sits on the architrave).

The cornice with the stroteras and calymmatias by "stora".

Note 89. See Baunack, J. Aus Epidauros. Eine Epigraphische Studie. Leipzig. 1890.

85. Terra Cotta Facings of Wooden Beams and of Stone Structural Members.

"Mortar and terra cotta", Semper writes, [90] are both very ancient traditional covering materials; of these, mortar was more frequently employed as a covering for masonry, terra cotta, chiefly as a covering for woodwork. Both the external wooden beams and also the internal ceiling were in the archaic temples entirel covered by richly ornamented terra cotta plates". Semper further states that the museums of Sicily and lower Italy (Palermo, Syracuse, Castelvetrano, Metapont, Naples, etc.) are rich in terra cottas of this kind, and he gives three different examples of these as evidence.

Note 90. In Der Stil etc. Band I. Frankfurt a M. u. Munich. pp. 446, Taf. 3.

Others had already been earlier taken from the ruins of Metapont (1833) by the Duc de Luynes and by Debaco and published; Le Bas [91] added further materials; Hittorf repeated and increased this in his great work "Restitution du Temple d'Empedocle a Selinonte, ou l'architecture polychrome chez les Grecs(Paris, 1851. Pl. 10, Figs. 4, 5, 6), adding especially in Fig. 5 "serving as a covering for wooden beams". Viollet-le-Duc also assumes wooden beams covered with terra cotta in his plates on antique architecture.

Note 91. Voyage archaeoligique etc. Paris. 1847-77. Unfin.

To the terra cottas of the Great Temple in Selinus published by Hittorf, others were added in the seventies, which were photographed and made known by Fiorelli in July1876 in Bulletino, Notizie degli Scavi di antichita communicata alla R. Academia dei Lincei di Roma; other fragments were found in the winters of 1876 and 1877 and were placed in the Museum at Palermo.

To these were then added the finds in Olympia, which afforded

new points of view in regard to the use of such terra cottas. The finds made at the Treasury of the Gelonas permit the assumption that the terra cottas were likewise emoloved for the decoration and for the protection of stone members. There is nothing surprising in this, if as particularly occurred in Sicily, the inferior and porous limestone were covered by a firm facing and terra cotta was preferred to stucco on exposed surfaces, or that the burnt-in painting on terra cotta was preferred to the perishable kind laid on stucco.

The mode of fastening these coverings, these terra cottas chiefly made in box form, to wood-work is made clear by the pieces in Metapont. The terra-cotta boxes 13.2 ins. high with reliefs and painted, which were in great part preserved there, exhibit square holes in their sides, through which copper (not bronze) nails were driven into the wood-work to be covered. Abruptly curved copper nails still remain in part in these holes. A great number of these, which accurately fit in the holes, are kept in the glass cases of the so-called Museum in Metapont; they all measure 5.1 ins. in length, are square and have square heads. The metal, form and size of the nails leave the former /130. /131. fastening in the wood without doubt; likewise the fact that the terra-cottas nowhere show vestiges of mortar on their backs, but only the clean surface of clay, permits the conclusion that these could only have been used on wood.

Fragments from Syracuse and Selinus exhibit similar arrangements for fastening and the same lack of marks of mortar.

Since some pieces are entirelv flat and have no added mouldings, they may have been flat middle pieces between two box pieces. But others again show mouldings and conical or cylindrical holes on both the painted and unpainted flanges(See Fig. 98 as well as the succeeding volume of this Handbuch, p. 161-162).

12). Principal Cornice.

86. Form in General.

The main cornice (crowning cornice, geison, corona) expresses the burden of the roof, crowns the building, and is the protection and shelter of its enclosing walls from injuries by weather. The gutters along the sides for collecting water (which are moreover not constructed on all monuments), the coronas and cymas that extend up the pediment, are borne by it and both crown the

cornice and the entire building in the most beautiful way.

87. Cornice Slab.

The crowning cornice first consists of narrow slabs of rectangular section arranged beside each other, which project far beyond the triglyph frieze and almost entirely cover its width, therefore terminating and affording protection to it. The front slab is usually crowned at top by an ogee moulding on which are painted or sculptured broadly lobed, recurved leaves; the upper part is sometimes wrought on the same block as the geison, sometimes on another one laid on this. A small and deeply undercut flat surface is visible beneath (fillet with water drip), always made prominent by strong color, from which the lower surface of the slab is obliquely cut away back to the front surface of the frieze, thus lessening the weight of the projecting portion and preventing the rain water from running back. The inclined surface generally abuts against a vertical one (Compare Parthenon, Theseion, Temples in Selinus, Phigaleia and on Egina) by undercutting the projecting slab, which projects but little beyond the head-band of the triglyphs. This slab is also reduced in height in some monuments, then terminating against the triglyphs in ogee form (Compare Propyleion in Athens, and Fragments from the Barbakeion there and in the Museum at Palermo).

88. Mutules.

Corresponding to the triglyphs and metopes and of equal width with the former, rectangular cut blocks (Mutules or Viae) conceal the inclined surface of the geison, are separated by incisions, and are ornamented by cylindrical or conical pins (Drops or Guttae), 3 rows in depth and 6 in length (making 18 in all. These mutules end abruptly against the vertical surface (Parthenon, etc.), or are connected together at the back by narrow borders (Propyleion in Athens), or they are wrought entirely free and isolated by incisions, lying beside each other on the inclined surface (Compare Fragments from Athens).

The middle of each mutule coincides with the centre of a triglyph or metope. Since the mutules are of equal width on most
132, monuments, though the metopes are wider than the triglyphs, the
133, width of the separating incisions depends on the difference between the widths of the metopes and triglyphs. On older temples, for example on the one in Selinus with the archaistic figure

decoration, the mutules above the metopes have merely half the width of the triglyphs and support only 9 drops.(Fig.99).

The different parts of the lower surface of the cornice, such as mutules, drops, and incisions, were painted in strong, unbroken colors, which clearly distinguish them from each other at a considerable distance. The mutules were of the same blue as the triglyphs, and the separating incisions were a full red; the drops may have been gilded. The surfaces of the incisions on the Propyleion at Athens still show painted plant ornaments (Penrose has even drawn vestiges of them); the same are also found on the Asklepieion in Epidauros [92]; the large inclined surfaces found at the angles probably had painted or sculptured anthemion ornaments. At the completion, drops that were broken off were again set in lead; others were previously fitted in drilled holes. On one of the Treasuries in Olympia, square holes were first cut in the surface of the mutules and square pegs were fixed in them by lead pins, the drops being then cut on them. The patching of a portion of the cornice in limestone in Athens is interesting, where the broken off fragment is held in place by an inserted double-dovetail piece of stone,- still movable! (See Fig. 62).

Note 92. See Praktika. Jahrs. d. Arch. Ges. in Athen. 1885.

On the Parthenon, the free portion of the vertical band against which the mutules abut was covered by a fret pattern; the ogee moulding found in place of this on the Propyleion was painted with a heart-leaf ornament, whose vestiges are still plainly visible. The narrow though long cornice-slabs, in order to make the closest possible fit and joint, touch each other on their abutting surfaces on margins 1.97 to 3.94 ins. wide, which are most carefully wrought, while the middle surface is sunken lower. They were connected with the divisions of the frieze lying beneath them by iron pins and with each other by the well known iron I-cramps. The drops of the mutules are usually wrought out of the same piece with them, though also exceptionally inserted separately (Fig. 99).

One peculiarity is still to be mentioned. At the points where the Guard-Hall and the Pinacothek join the central building of the Propyleion in Athens, the mutules on the horizontal cornice are wanting. The regulas and drops of the triglyph above the

antae standing next the middle structure are still preserved; the triglyph itself is no longer in existence. The head-band of the architrave and of the triglyph is extended along above the plain wall surfaces, the still preserved cornice above it consisting of a deeply undercut geison, crowned at top by a small moulding, which passes into the vertical wall by means of an ogee form, and returning at a right angle, runs to the side wall of the central building (Fig. 99). The present condition of the monument and the absence of the part of the cornice at the point in question does not permit one to ascertain now in what way the transition was made from one building to the other.

The mutules are accordingly omitted on the inclined under
137. surface of the geison, whenever this extends along above a
plain frieze; they must also disappear from the pediment geison, which extended above the plain geison.

As a matter of fact, no Grecian monument exhibits mutules on the under surface of the pediment cornice slabs; these rather consist of a plain band on their front surfaces with an ogee moulding, as if crowned with recurved broad lobed leaves. the front surface of the pediment geison being in the same plane with the horizontal main cornice geison.

The pediment geison is strongly undercut, terminating in a slightly curved form at the front edge of the geison and ending against the pediment wall with a bold ogee moulding. Like the horizontal cornice, this is composed of proportionally narrow blocks extending across the entire pediment wall and fastened together by iron pins.

The starting blocks of the pediment cornices on the Parthenon and Theseion are wrought from a single massive block of marble together with the horizontal cornice, and which rests on the angle triglyph and the two adjacent metopes; it does not abut against the adjacent parts over the second triglyph from the angle, but over the metope itself.

On the Propyleion, a portion of the cyma is wrought from the same block as the starting stone of the pediment cornice, thus forming the heavy angle stone of the pediment, which rests on the slab-like angle block of the horizontal cornice.

The apex of the cornice is cut as a horizontally bedded block

of stone resting on the pediment wall, and whose inclined joint surfaces are made at right angles to the inclination of the pediment.(Compare Theseion and Temple in Akragas).

69. Cyma.

Resting on the pediment cornice rises the crowning moulding for collecting and carrying off the water, the cyma in form of a flat echinus moulding bordered above and beneath by fillets (Parthenon, Propyleion), of an ogee or reverse ogee moulding (Phigaleia, Egina), or rising as a flat surface (Athens, Selinus), decorated by aspiring anthemion ornaments (Parthenon, Egina, Phigaleia), or palm-leaves directed upwards and downwards (Fragments in Athens). Generally arranged at right angles to the inclination of the pediment, this ornament was sculptured on the cyma(as in Phigaleia), or merely painted (as on the Parthenon and on Egina); on the Propyleion, the intervals between the pointed and ovate leaves were sunk deeper, the form of the leaf being outlined with the point tool, and the edges and surfaces of the leaves were painted.

The gutter cymas on most Attic Doric monuments were only carried along the pediment and were therefore omitted on the sides, where they are returned but a short distance, and they always ended in right section concealed by a lion's head (Compare Parthenon, Theseion, Temples in Phigaleia and on Egina, also Temple A in Selinus).

The cyma was cut in the marble or executed in terra-cotta, and it consisted of pieces of moderate length, which concealed half the depth of the cornice slab and were joined together at their ends by a peculiar water-tight rebate. (Fig. 100).

The rain water falls to the ground along the sides over the edge of the cornice without obstruction or being previously
135 collected, the gutter cyma of the pediment merely prevents the water from running over in front, and chiefly gives to the cornice the expressive and rich termination, forming the crowning frontlet, the ornamental diadem of the beautifully treated sanctuary.(Fig. 100).

Temples B and S in Selinus carry the cyma along their sides also; they are then decorated by projecting lion's heads at fixed intervals, from whose open mouths the rain water falls to the ground. Simple conical tubes are carved in marble and

also perform this service in a less ornamental manner. (Compare cymas from Athens and other places as in Figs. 102, 103).

Vitruvius requires these lion's heads to be first placed above each column, the others being similarly arranged to cor-
136, respond to the centres of the roofing tiles. The first are to
137, be perforated like spouts, the others being solid, so that the water may not descend in streams between the columns and fall on persons passing between them. In case of strong winds or storms, the intercolumniations would not be free from water, even were it only discharged in front of the columns.

The principal use of the lion's heads on the cymas of Grecian buildings as water-spouts (hydrorrhoa) is indeed to be as-
138, cribed to Egyptian precedents. When the sun entered the constellation of the Lion, the annual fertilizing overflow of the waters of the Nile commenced; all fountains architecturally treated by the Egyptians flowed from the mouths of lions; among the Greeks, the lion had the symbolical signification of protector of fountains; also with them, the sacred water gushed from the mouths of lions. These lion masks must have been first used by the Corinthian sculptor Dibutades as hydrorrheas on the gutters of the roof.

The cyma and the additional small mouldings shone with rich decorations in colors, as still shown by the Sicilian remains, the added lion's heads being very strongly colored or entirely gilded.

90. Historical Form.

If we search for the historical form of the main cornice,-- the same is true as for the triglyph frieze, --we must again return to the wooden huts of Asia Minor.

139. Above the closely set round wooden timbers, which were later made square in section and spaced somewhat apart, but were always small, lies a high wooden construction, which extends around the building and serves to prevent the material of the horizontal or convex terrace roof from sliding off. This structure beneath the low domed clay roof was covered by ornaments and is again found in the architecture of the Francois vase.

If the interpretation of the very defective inscription[98] in reference[94] to the rebuilding of the city walls of Athens by Choisy be correct, a longitudinal timber (N) of fixed height

was required above and along the ceiling beams projecting beyond the face of the wall, which, after the slope of the roof had been formed, had to prevent the slipping of the pise piled up in form of a gable roof or of unburnt bricks (M, Fig. 104). The gable roof of pise occurs here instead of the flat or low domed clay roof, while the precautions against sliding of the mass of earth remain the same.

If in this construction of the last years of the 4 th century B. C. (306 - 303) an ancient construction of the cornice is imitated, and it has not rather resulted from the peculiar purpose of the building, the ground form of the translation into stone would be found, although not for decoration, for which all data are lacking.

Note 93. Discovered 1829. See:- Bullet. d.Inst. Archaeol. March 1835; also see Müller, C.O. De Munimentis Athenarum etc. Göttingen. 1836.

Note 94. In Etudes epigraphiques sur l'Architecture Grecque. I etude; Les murs d'Athenes d'apres le devis de leur restauration. Paris. 1883. Sect. 60-65.

The angle block of the cornice of the Treasury of the Megareans in Olympia (Fig. 105) shows us how the basal form is to be kept separate from the ornamental form. For the use of the often very rich and beautifully decorated front protecting tiles as facings for ends of ceiling.beams affords additional information in reference to the description of the work for the Athenian walls, which is also stated in the succeding volume of this Handbuch (Fig. 183, p. 207).

But if we assume the roof with rafters to be a later advance, instead of the clay roof, then must the ground form of the later stone cornice be derived from the combination of beams and pairs of rafters, as indicated by the Temple of Concordia in Akragas in Fig. 105 (Also see the volume just referred to, Fig. 184, p.208). Then the front surface of the geison may be regarded as corresponding to the continuous face-board of the ends of the rafters (with or without a terra-cotta covering of the board), the mutules or viae to the sndersides of the projecting rafters, inserted and ornamented small boards, and the narrow vertical band, to the continuous covering strip, that protected the cut-off ends of the beams.

91. Terra-cotta Facing.

The terra-cotta facing and the arrangements for fastening it to the timbers of the roof and ceiling are verified by finds of such objects and by evidence of the building contract for the city walls of Athens[95].

Note 95. Compare:- Die Funde von Olympia. Edit. in one vol. etc. p.36 - 38, Taf. 38 - 40. Berlin. 1882. Also 41 Programm zum Winckelmannsfeste d. Arch. Gesell. z.Berlin. 1881. The decision of Fenger (Dorische Polychromie etc., p. 19. Berlin. 1886) in reference to covered woodwork has meanwhile been corrected to accord with the facts. His rather perplexing text appears to substantially repeat the views of German masters, gratitude to them being expressed in a preface. On account of the copper nails in Metapont, the law (in 41 Programm z.Winckelmannsfeste d. Arch. Ges. z.Berlin, p.11, Berlin, 1881) that the terra-cotta boxes are to be regarded as facing pieces for the geison, is no longer tenable.

Similar terra-cottas, as we have shown them in Metapont, Syracuse and elsewhere, were also certainly employed in Olympia; but judging from the stone cornices remaining, they were fixed on these and not on woodwork.

In the ruins of the Treasury of the Geloeans were found fragments of the geison of shell conglomerate, which had a groove set back on the top and iron pins in the front surface. The block examined at the locality by me (1890) still retained projecting iron pins at distances of 7.1 and 15.7 ins., slightly projecting from the surface and occupying the middle of the front side. The inclined under surface of the stone was covered by thin red stucco. In the "41 Programm zum Winckelmannsfeste der Archaeologischen Gesellschaft zu Berlin" iron pins are mentioned, but on the front and upper surfaces of the stone.

Bronze pins were found in the ashlars supporting the rafters op Temple C in Selinus after the discoveries in Olympia. According to my sketches made in March 1884, these ashlars have a length of 3.94 to 6.09 ft., a width averaging 2.89 ft., and a thickness of 1.57 ft. and over, according to whether the upper surface is dressed off more or less roughly. A border on this is cut better for 10.2 to 18.9 ins. from the front face, and the front surface is more carefully dressed. The border is

sunk .20 to .79 inch. Bronze and iron pins remain in this at distances of 7.28 to 7.88 ins. from the front edge. Not all of the existing blocks have at this time these pins (five belonging to the north side and one block of the south side, fallen into the cella). Many are free of them and bear no mark of anything of the kind. Angle blocks were not preserved; even the
141 pediment geison has disappeared. Some of the pins are at the junction of the border and the rough upper surface; the distances between the pins and pin-holes do not correspond with the notches for the rafters, and are also not repeated at regular distances (Fig. 107).

These arrangments on the cornice stones are rightly referred to facings of another material, and such facings of painted terra-cotta were first found in Olympia and made credible by Dörpfeld and his associates. The box-shaped facings found by them and their fastenings must have accurately fitted the iron pins in the stone in regard to dimensions and distances.

The terra-cottas found at the Temple C in Selinus and exhibited in 1884 in the Museum at Palermo show no nail holes in the unpainted flange; all these were rather found in the painted front surface with the head-band, and in none is the latter sufficiently preserved that its ending may be given with certainty. But this does not exclude that other pieces with other peculiarities existed or now exist there or at other places.

After the descriptions and discussions, one can no longer doubt the use of terra-cotta on stone[96].

Note 96. See on the other hand Hauser's Conference on the 41 Programm zum Winckelmannsfeste der Arch. Ges. zu Berlin. Berlin. 1881.

Scarcely any different impression exists concerning the use and arrangement of painted terra-cotta cymations with the noteworthy heights of 1.64 ft. and over. They were employed in Selinus, Syracuse, Gela, Metapont, Olympia, etc., and they extend along the pediment cornice as a crowning member and along the sides of the temple as a great gutter for water, as already shown by Hittorf. These must in time have given way to those of hard, fine-grained limestone, as shown by examples from Selinus, Himera, and Akragas, whose heights then increased to from 2.46

to 2.63 or even 2.69 ft.

In regard to profile, ornamentation and color, these limestone cymatiums are faithful copies of the older terra-cotta cymatiums; they also exhibit to us the mode of connection with the roof tiles and the careful end jointing of the pieces by overlapping grooves, the addition of small metal cramps and the introduction of grout mortar, as well as the covering of the side joints by hollow tiles, which extend nearly to the back side of the cymatium. The gutters, i.e., the width of the channel for water, remain relatively narrow, for they only measure 633to 7.1 ins. in Himera and Akragas. The water was led from the collecting gutters through the so-called spouts, which were formed like projecting rectangular channels, as widely opened lion's jaws, or like trumpet mouths. These were evidently only required on the eaves. Tubular mouth-pieces for spouts have already long since been found on marble cymatiums in Athens, and similar ones of terra-cotta in Olympia and also by Cavallari in Selinus. The piece exhibits complete harmony with those found in Olympia, is preserved in the Museum in Palermo, and was published by Cavallari in 1882.(Scavi di Selinunte, eseguiti nell'anno 1882). A piece of a box in the Museum at Castelvetrano exhibits the addition of such a mouthpiece to the front of a painted terra-cotta water gutter.

The water from two vertical rows of tiles (together 3.7 ft. wide) on the Temple in Himera was led to one spout, whose opening at the smallest section is 2.75 ins. high and 4.72 ins. wide. On the small Treasury of the Geloans, two spouts were assigned to a row of tiles 1.9 ft. wide, and whose circular sections are 1.57 ins. diameter. A cymatium, found in Akragas, exhibits an oublet opening 2.36 ins. high with a width of not even .79 in.; the tubes from Selinus have a diameter of 1.38 ins., and those on an Athenian cymatium are only .98 in., thus all have rather small sections. The number of spouts must increase the disadvantages by their small sectisns, and the cymatiums are 1.64 to 2.46 ft. high and prevent the water from running over.

The pieces of the cymatium also frequently had exactly the width of the gutter tiles, and their sides were bent up like those, which were covered as far as possible by cover tiles,

an arrangement that probably proved better, like all the ingenious detailed descriptions of the rebates on the high cymatiums, and which were also retained even in the latest period (Compare Pompeii), and even then received improvements. A spout was there for each row of tiles, so that the cymatium could be lower and the outlets remain small. The remains of cymatiums in Metapont belong to this class.

As before stated, the buildings of Pericles in Athens did not have gutters for water (cymatiums). The water fell freely from the lowest range of tiles, or in windy weather ran down over the face of the geison to its drip and then fell to the ground. Instead of the decorated cymatium along the long sides, we find the ornaments of the antefixas in use, sometimes ranging with the cover tiles, sometimes only placed as decorations. (Compare Parthenon). This was at all events the older arrangement; the termination of the lowest cover tile by a flat surface or an ornament placed before it is readily suggested, has a technical basis, and affords an effective ornamentation of the upper horizontal line without further trouble. But the combined or united antefixa ornament must be just as ancient, which is solid with the lowest flat tiles of the roof and conceals behind itself the cover tiles of the lowest range (See Fig.100).

The interlaced and painted terra-cotta anthemions, nominally found in greater number at Temple C in Selinus, stand on flat
143, 144 tiles with a front facing and curved edges at the sides, i.e., are one with them. Corresponding to the other flat tiles of the roof, they were 2.46 ft. wide and were indeed nailed on the rafters like gutter tiles.(Compare the Lex Puleolana, Corp.Lat. Insc.No.577, which requires the nailing of the lowest range of tiles). While the anthemions are mostly well preserved, the flat tile portion belonging to them only remain in short pieces about 698 ft. long. Their original form therefore cannot be entirely determined. The water from the roof surface escaped through places left open in the interlacings. The painting of the front facing of the anthemion gutter tiles clearly indicates their projection beyond the cornice members beneath, as this was everywhere usual with the ordinary gutter tiles. Nothing surprising can be found in the flowing of the water between the anthemions, since the same likewise occurred on the Athenian buildings, -

certainly with larger openings.

Moreover, Selinus does not stand as the only example of this. A fragment in the Museum at Metapont still more strikingly exhibits the projection of the gutter tile decorated by anthemions. The round on the under side is painted in a single color and acts as a water drip; the under side is painted for a width of 3.94 ins. and shows a broken place beyond this, and it is therefore not improbable that a vertical flange extended downwards there, as shown by another fragment of a painted tile preserved in Metapont, on which the projection for the anthemion exists, whose stem or base is decorated by an ornamental projecting lion's head. It may then be permissible to regard the piece in question as the gutter cornice tile of a projection with rafters, where the bases decorated in relief covered the front ends of the rafters, or the strip fastened before them. (Compare the succeeding volume of this Handbuch, Fig. 50, p57).

The ancient constructions of the roof, which are imitated on an Etruscan chest for ashes (Museum in Florence) and on Grecian reliefs (Museum in Naples), partly exhibit overhanging pairs of rafters. A painted fragment of a tile in the Museum at Syracuse also by its form admits of the conclusion of a similar purpose; only the anthemion is not set back there, but is in the same plane with the facing flange. Projections affording
175 projection also appear on the known gutter tiles of Olympia with the undercutting like a water drip, and the gutter tile of Aegion published by Hittorf (Pl. 83). Other fine examples also lie on the Acropolis and in the Theatre of Dionysos at Athens, a representation of which is given in Fig. 108. An example of a gutter tile with "kalypt" and antefixa worked on it s found in Fig. 108, of the kind frequently found in Olympia, executed in larger and smaller dimensions. The older terra-cotta cymatium pieces (Treasury of the Geloans; Syracuse) mostly exhibit the form of the Egyptian cavetto cornice, while another (indeed [100] later) group has flat surfaces with a cymatium moulding at top.

Note 100. See Puchstein, pp. 52, 53.

Pieces have also recently been found by the excavations in Pompeii, which are similar to those described.[101]

Note 101. See Duhn, F.v. and Jacobi, L. DerGriechische Tempel in Pompeii. Taf. 6, 7. Heidelberg. 1890.

92. Restoration.

The terra-cotta finds at Temple C in Selinus have given opportunity for the restoration of the corresponding principal cornice, which has on the part of the Germans been published by Dörpfeld [102], and on the part of the Italians by Cavallari [103]. We reproduce in Figs. 109 and 110 the efforts of both, with the remark that according to Cavallari, the cornice of the temple would have appeared somewhat high, except that the beautiful crowning anthemion of the gutter tiles, when seen from below, would disaapear or its effect would be lost with the observer at a considerable distance. No evidence exists for the addition of the selected cymatium with the trumpet-shaped spouts, and holes through the ashlars supporting the rafters are not found. Moreover, no artisan would permit such eccentricities
146 in the removal of the water. Excepting the doubtful upper ending of the gutter tiles and their fastening to the stone, Dörpfeld's essay should be accepted as correct [104].

Note 102. In 41 Programm z. Winckelmannsfest d. Arch. Ges. z. Berlin, Pl. 2. Berlin. 1881.

Note 103. In Notizie degli Scavi. 1882. Pl. 19.

Note 104. In regard to colored terra-cottas, also see the succeeding volume of this Handbuch, Figs. 182, 183, 50, 54, 55, 186, and 193; also further:--

Durm, J. Constructive und Polychrome Details der Griechischen Baukunst. Berlin 1880. Taf. 10.

Hittorf, J.J. L'architecture polychrome chez les Grecs. Paris 1846. Taf. 6, 7, 10, 13.

Le Bas, Ph. Taf. II, 1, and Taf. II, 2.

Semper, G. Der Stil in den technischen und tektonischen Künsten. Frankfurt a.M.u. München 1860-63.

Rayet, O. & M. Collignon. Histoire de la ceramique grecque Paris 1888. Pl. 15, 16.

The raising and setting of the massive cornice blocks of the Temple in Selinus, which frequently measure 727 cubic ft or more (12.5 × 12.5 × 4.42 ft.), are known to have been done by ropes lying in U-shaped grooves cut on the end faces of the ashlars. After the stones had been raised, the sling ropes were removed, the stones slid exactly against each other and fitted. The same rope slings could then be used for setting, without the [illegible]

necessity of tying them again, ekcepting for those inserted last. On these, instead of the U-shaped grooves on the end surfaces, there are found rectangular grooves continued on three sides, whose inner surfaces are rounded off below. Sling ropes were laid in these, while after setting, the ropes could readily be drawn out (Compare Fig. 89).

13). Ceiling of Portico.

93. Ceiling Beams.

The open space between the columns and the cella walls received its ceiling finish at top by means of slabs of stone, or by a system of stone beams with slabs laid between them.

These ceiling beams must have originally been laid on the architrave with reference to the position of the columns and the arrangement of the triglyphs, formed the termination, and a change in the construction and treatment of the forms first occurred with the adoption of stone construction.

One must assume that Vitruvius used ancient traditions for his explanations and accounts of beam construction; but so much is certain, that already five centuries before Vitruvius, these traditions were no longer held or understood, while not a single Doric building now remaining to us accords with them. The transfer of the architrave to the cella wall indeed occurs(Compare Pronaos of the Theseion), and also the transfer of the entire entablature (architrave and triglyph frieze) above the inner row of columns extending before the pronaos (as in a Temple in Selinus): but we never meet with ceiling beams placed on the architrave itself.

Where stone beams are used, they are set at the same height as the geison, are of rectangular section and are wider than high, with an echinus moulding on the upper part of their sides, the top surfaces are not entirely dressed, but usually only as wide a smooth bed is arranged, as required to receive the slabs. The beams are commonly placed without reference to the columns, and they are arranged at equal distances in the limited space. (Compare Theseion and Parthenon; also Fig. 111).

147. On the pronaos and posticum of the Theseion and of the Temple in Phigaleia, the end beams extend over two intercolumniations and run parallel with the inside of the frieze, every reminiscence of an original intention of showing the ends of the beams

in the frieze disappearing.

Therefore the beams at the pediment ends run at right angles to these, and on the sides they are at right angles to the architrave and the cella wall.

94. Ceiling Slabs or Stroteras.

In the beams lie the covering and space-enclosing slabs, the Stroteras (coffered slabs) with coffer-like sinkings or perfor-
148 ations; rebates were further cut around the rectangular openings in the slabs, in which were laid smaller ceiling stones, the s space-closing Calymatias, whose ground was not wrought flat but somewhat curved. But in addition to the square sinkings, others of lozenge form also occur, as on the Temple in Phigaleia. The coffers were not made of equal size, three different sizes being arranged beside each other on the Parthenon and at Phigaleia.

This characteristic construction and subdivision of the stone ceiling by beams, stroteras and calymmatias (Fig. 112) is only peculiar to the Grecian style of architecture; rectangular dividing beams are indeed found on the ceilings of the Grotto-Tombs in Beni-Hassan, cut in the solid rock, between which are wrought plain ceiling surfaces in form of flat vaults, thereby being divided in square spaces decorated with allied ornaments, so that in regard to form, these ceilings might supply the model for the Grecian ceiling, though not in construction. The same idea lay at the basis of the decoration of both; we find in both the panels of the ceiling sprinkled with stars.

The rather careful and minute constructeon of the ceiling of the Theseion[105] is abandoned on the Parthenon (Fig. 114); instead of the small ceiling pieces above perforated slabs, calymmatias wrought on the same piece with the slabs are used. The transition from the lower surface into the curved back-ground of the coffers is then arranged in two recesses, whose transitiions are formed by small echinus mouldings. The construction is still more simplified on the ceilings at the sides of the Parthenon and the Temple in Phigaleia; even the beams are there entirely omitted, the ceiling being entirely constructed of coffered slabs resting on the cella wall and on the frieze.

Note 105. How much econocy was here practised is shown by a place now become visible, where thin slabs were inserted instead of the wall beam. (Fig. 113).

149. The horizontal borders surrounding the coffers separate painted or sculptured beaded astragals (Compare Parthenon and Theseion); fret patterns cover the horizontal surfaces (Parthenon), eggs-and-darts cover the separate echinus mouldings (Parthenon, Theseion, Propyleion), and golden stars on a sky-blue ground cover the back-ground of the coffers, a motive recalling the covering of the sky, and which characterizes the ceiling as a shining starry-ceiling (Uraniskos).

Golden palm ornaments on a blue ground, developed towards and from the centre, replace the stars on the ceiling of the Propyleion. Bötticher wishes to restrict the use of stars to the ceilings of consecrated apartments alone, and therefore refers the coffers decorated by palm ornaments to the side passages of the Propyleion, for the central passage alone was the sacred way,-- an opinion not accepted by every one.

95. Decoration and Dimensions of the Stone Beams.

The cornice extending beneath the beams above the frieze and above the cella wall (Compare Theseion and Parthenon) was decorated on its vertical surface by a richly painted fret pattern, the crowning member being ornamented by recurved leaves, and the ogee by heart-leaves. The beams have leaf ornaments on their echinus mouldings; their under surfaces were probably ornamented by painted interlacing bands, the last assumption being justified by the box-shaped terra-cotta facings in Metapont.[106]

Note 106. See also; Baunack, J. Aus Epidauros. Eine epigraphische Studie. p. 70-75. Leipzig. 1890. .. IV. The stone ceiling of the Temple of Asklepios,-- especially p. 72-73, on monolithic ceiling slabs as well as on the decoration and painting on stroteras and beams.

The beams in part rest on iron pins; they are connected with the interposed beams by I-cramps (Compare Parthenon).

At the Parthenon, the beams have a sectional area of 6.57 sq. ft. for a length of 14.34 ft. and a bearing of about 1.97 ft.; they are loaded with about 22000 lbs. Beams worked concave are mentioned as found at Phigaleia.

14). Ceiling of the Cella.

96. Hypotheses.

Unfortunately, no vestiges of the ceiling of the cella are

now preserved, and no monument throws any light on what it was, of what material it consisted, and how it was constructed. The complete lack of the structural portions appertaining ttereto in the ruinous condition of ancient temoles. oermit it to be safely assumed that these ceilings were of perishable material, and the knowledge of so many conflagrations of temples, that they were made of wood. Not proven for most is the law, that on account of its considerable span, the central space of the cella could be covered with wood alone.

150. 151. The central aisles of the Temples on Egina, in Phigaleia, and of the Heraion at Olympia, measure 10.73, 14.47, and 12.47 ft.; architraves and stone beams in lengths of 14.63 ft.(Temple C in Selinus), 13.98 ft.(Parthenon), 17.82 ft. (Propyleion), etc. occur as sufficient, both constructed of common limestone as well as of marble. The possibility of a stone ceiling then existed in case of the given widths of centre aisles, even though I may doubt its use.

A passage of Pausanias in reference to the Heraion in Olympia gives some points in regard to the arrangement of the ceiling and the roof.

During repairs made to the latter,"The corpse of ^ heavy-armed soldier was found between the two ceilings, one of which was for ohnament, the other for supporting the roof". It results from this, that a decorative horizontal ceiling covered the cella, and an empty space existed between this and the pediment roof. In the construction of the closed ornamental ceiling, transverse beams were probably first placed at fixed intervals, then crossed at right angles by longitudinal beams lying on them, the interspaces being again divided in panels by short beams and closed by board panels above.

Coverings of terra-cotta enclosing the beams on three sides in box shape and shining with rich ornamental colors, their under surfaces decorated by interlacing bands, coverings of plates of the noble metals and by painting, may have produced in these ornamental ceilings a magnificent effect. Pausanias mentions in Athens "chapels with gilded ceilings, decorated by alabaster and paintings"; wooden beams and calymmatias are mentioned in the era of the Diadochides as entirely gilded and ornamented by ivory and mosaic work.

The wooden ornamental ceilings probaly extended overe both the centre aisle and also the narrow one ot two story side aisles.

15). Pediment.

97. Tympanum.

The pediment was the most expressive external decoration of the end of the Grecian temple, -- it received the most prominent sculptured ornamentation of the house of the deity, which from a protected niche surmounted by the widely projecting roof cornices and standing firmly on the bold geison, shone down on the person approaching, while still distant, splendid in its sublimity and fascinating his gaze and his soul. Deeds of gods and of heroes are represented in them; one bringing offerings would involuntarily be aroused in spirit and prepared by this exhibition long before entering the sanctuary; his thoughts would be diverted from external things, and he would himself be strengthened in the belief in the power of the particular deity by the sight of the glorifying representation of his deeds.

The pediments of the Parthenon were decorated at one end by
the Birth of Pallas (Minerva), and at the other by the Contest
of Poseidon and Pallas[107]. On the Temple of Zeus in Olympia was
the Chariot Race of Pelops and of Oenomaos with Zeus as a central
figure between the champions, at the other end being the Combat
of the Lapithae and Centaurs at the Marriage of Perithoos, where
152 the hero Theseus keeps off the Centaurs with his axe. In one tym-
panum in Tegea was the Calydonian Hunt, on the other the Combat
of Achilles with Telephos. The tympanums of the Herakleion in
Thebes were filled with works of Praxiteles representing the La-
bors of Hercules. Artemis, Lato, Apollo and the Muses, stood in
the pediment in Delphi; Dionysios and the Thyades adorned the
rear pediment. On Egina were Combats from the Trojan War, Pallas
protecting the corpse of Patroclus. We always see the deity stand-
ing and distinguished as a principal figure in the triangular
space. The composition must be adapted to this form and it was
so suited with extraordinary skill. The forms standing next the
153 central figure appear in a position similar to this, though oft-
en bending somewhat, the next stooping more, and then come pers-
ons sitting or kneeling, and at last those reclining, always fol-
lowing the form of the inclined pediment cornice in place and po-
sition. Only by means of these gradations in altitude and pose

could the space be filled with figures of equal sizes.[108]

Note 107. See Sauer, B. Die Standplatten der Gieblegruppen am Parthenon. Antike Denkmäler u.s.w. Berlin 1891. Bd.1, p.48-51. Taf. 58 A B C (especially the section on arrangements for setting the statues, marks of fastenings, new figures in tympanum (patina), western and eastern pediments) Also the Parthenon Drawings of Nointel's Anonymous, those of Carrey in Antike Denkmäler etc., Bd. 1, p.2, taf. 6, 6 a. Berlin. 1891.

Note 108. Treu, G. Die Anordnung des Ostgiebels an Olympischen Zeustempel. Jahr. d.Kais. Deutsche. Arch. Inst. Bd. IV. 1889. Berlin, 1890. p. 206-311(especially the appendix on p. 304, as well as on Taf. 8 and 9 the various illustrations by G. Treu, F. Studnicza, R. Kekule, and E. Curtius); also the view of J. Six in Jour. of Hell. Studies. Vol. 10, 1889, p.98 e.s., which is summarized in the above mentioned volume (p.304), and which appears best and most acceptable, judged from a purely artistic point. For the western pediment, see Jahr. d.Kais. D. Arch. Inst. Bd. 3, Taf. 5, 6. 1888. Berlin, 1889.

On the Temple on Egina (Fig. 115), exactly in the centre stands Pallas armed with the spear; right and left of her stand marching, sprawling, spear-throwing warriors; the vacancies at the base are filled by the fallen Patroclus and a Trojan bending over him; then follows a kneeling archer, behind whom a kneeling spearman bends forward, the angles are filled by prostrate wounded men.

The figures were all wrought in the round, mostly carved in limestone or fine marble (they were made of potter's clay on the roof of the Royal Hall in the Keramikos at Athens; also see Art. 15), and stood free on the geison, which was thus loaded on its front by a not inconsiderable burdens, the geison slabs are loaded by the tympanum wall, which closes the triangular opening of the gable roof and is covered by vertically joined slabs (as on the Parthenon and Theseion), or arranged as horizontally coursed masonry (as on a Temple in Akragas and also at Egesta; See Fig. 116). To obtain more space for the display of the figures, this background is not set in the same plane with the front surface of the architrave, but is set back behind this from 1/8 to 1/5.5 times the thickness of the architrave (Compare Parthenon, Egina, also Figs. 117, 118).

Decoration by color likewise occurs here as an enrichment; the tympanum was covered with a dark-red tone, from which the groups of figures stood out clearly; but the variously colored figures may also have stood before a light back-ground of the tympanum, since we have examples of both; the naked portions of these may have only received a transparent tone of flesh color. while the draperies displayed all the colors usual in clothing and may have had a wax polish; the weapons shone with the gleam of gold, which was laid on the stone, or spears, helmets and shields were entirely made of the noble metals and fastened to the marble.[109]

Note 109. In regard to the great question of the sculptured decoration of the tympanums of the Parthenon, see:-- Puchstein, O. Die Parthenon.Sculpturen. I. Phidias. Jahr. d. Kais. D. Arch. Inst. Bd. V. p. 79 e.s. Berlin 1890. Also:- Blümner, H. Der Meister der Parthenon Sculpturen in Beil. z. Allg. Zeit. 1891. No. 113.

98. Acroterias.

The angles and apex of the pediment received a special decoration by the so-called acroterias. Animating the outline of the building in an effective way and emphasizink these especially expressive parts, they stood at the angles on massive stone pedestals above the cymas, employing chimeras, fanciful animal forms, small figures, or decorative compositions of scrolls and palm-leaves (anthemions), such as we also find crowning sepulchral steles or vases as well.

154. According to Pausanias, there were gilded prize vases on t the angles of the Temple of Zeus in Olympia, and a gilded Nike exactly above the centre of the pediment, under whose statue was fixed a golden shield, on which was to be seen the Gorgon Medusa in embossed work with an inscription beneath.[110]. For one of the Treasuries, a shield with inscriptions is mentioned above the apex of the tympanum, in the tympanum itself being the Combat of tte Gods and Giants in relief.

Note 110. The inscription was found, and it stood on a stone base, which was fixed on thh apex of the pediment and bore the shield of Tanagra. See Arch. Zeit. 1882. p.179-188.

The crowning ornaments of the angles and apex of the pediment of the Temple on Egina (Fig. 119) still remain to us (pres-

(preserved in Munich); they are griffins carved in marble, which were indeed originally painted in colors or gilded, and two slender draped female figures, which stood on the right and left of a lyre-shaped raised scroll ornament, which was crowned by a vertical palm ornament. Only a few insufficient fragments of a similar ornament from the Parthenon are preserved, from which we may infer a decoration of the apex of its pediment allied to that of Egina. Data in regard to the angles is wanting; there are now merely square openings cut in the starting stones at the angles (Fig. 120), in which metallic or marble vases, figures, or ohnamental decorations were once fastened; no vestige of these any longer remains[111].

Note 111. Statue acroterias on the ridge of the Temple in Delos were proved and restored by Fürtwangler. See Arch. Zeit. 1882. p.335-346.

155. 156. No structural reason exists for the use of these acroterias; the stone bases required for them could not easily be formed of smaller blocks of stone; these blocks are now wanting on the Theseion, on the so-called Temple of Concordia in Akragas, and on the Temples in Egina and Paestum, while the pediment cornice slabs are still in place and undisturbed; if these angle stones were placed there as a necessary loading to oppose the thrust of the obliquely inclined cornice slabs as an abutment, these latter would have slid down on their removal, which is not the case and is impossible, from the construction of the end blocks of the pediment, the bond, and the form and position of the intervening pieces.

On the Parthenon, the base stone lies in the angle of the hollowed-out marble gutter, loading this, but rather tending to overload and tilt over the projecting parts, than to fix them. The same was the case with the central acroteria, since the base stone was also there placed in the cyma, on the freely projecting, and not on the supported portion of the cornice slabs. (Compare in this respect the drawing of the acroterias of the Temple on Egina, and Fig. 119).

99. Acroterias in Volute Form.

Acroterias in the form of volutes for Grecian buildings were not previously known. They were found in the rubbish on the Acropolis in Athens and were first published in the authority

mentioned[112]. The foundations of the building to which they belonged could not be more fully determined. Pieces of the cymatiums belonging to theg had long been known and had been published in different places. In 1869, they still lay with other colored fragments in a heap in a small shed of boards on the Acropolis. But the material had not then been thoroughly sifted and did not exhibit the cymatium at all in its perfect condition, as for example, the red and white chess-board band on drawings made in the forties was wanting, and the blue color on later ones. Pieces examined and drawn by the author in 1869 exhibited no vestige of blue color, while this was given in the twenty years earlier drawings of Hochstetter, althosgh only in the rings and not on the leaves; on the other hand, the crowning head-band was lacking.

Note 112. Antike Denkmäler. Herausg. vom Kais. D. Arch. Inst. Band I. Heft 5 (1890). Berlin, 1891.

"The colors on these painted marble cymatiums are of an earthy nature and fade very easily[113]."to which fact is to be ascribed the different statements. The ornaments cilored blue and red are lightly wrought with the chisel, and the colors are laid in the sunken surfaces and lines.

Note 113. See same, p. 36, and Taf. 50, frsm which Fig. 121 is reproduced.

100. Acroterias of Wood and of Clay.

The stone acroterias of the marble roof were preceded by those of clay for the tile roof, and the latter by those of wood for the roof with wooden cornice. Examples of the latter are preserved to us in the Phrygian rock-cut tombs, in which the face-boards of the formmost pair of rafters extend far above the intersection at tte apex, as we still see in the Tyrolese wooden houses, forming a characteristic decoration. The development of the form of the acroterias then corresponds to the peculiarities of the different materials, - wood, terra-cotta, and stone.

Stone permitted execution in the way of sculpture, by its greater resistance to exposure, wood admitted of only sawed-out or carved work, which were chiefly simple and effective outlines ; (See Figs. 179, 180, p. 264, 205, in the succeding volume of this Handbuch); clay required closed forms, within whose outlines could be employed relief ornament, which color could make

make more prominent and effective. An example of the last kind
158 is given by the fragments found in Olympia and preserved, which belonged to a semicircular acroteria on the pediment of the Heraion, and which is shown with its connections in Fig. 122. A similar circular form of the pediment acroteria was also made known by Le Bas[116].

Note 115. See:- Die Funde von Olympia. Berlin 1882. Taf. 38.

Note 116. In Voyage arcaeologique en Grece et en Asie mineure. Paris 1848. Sect. Architecture. Pls. II 2, II 5, II 7, III 11.

16). Roof of the Temple.

101. Framework of the Roof.

The temple roof (Aetoma) forms the external protecting covering of the building; constructed as a low gable roof, its two roof surfaces intersect in the middle line of the structure and conduct the rain water toward the sides. We indeed no longer possess any direct data on the construction of the framework of the roof, since from the perishable nature of the wood and materials of which it was composed, no remains at all are preserved to us; yet we can decide on its original form with tolerable certainty fhom the covering materials preserved, from the holes cut in the stone cornices of different temples, and from building contracts.

159 According to these, the framework of the roof was constructed of inclined rafters and purlins parallel to the eaves; the purlins could then rest on the pediment walls and also on the transverse walls of the pronaos and posticum, which were indeed usually extended up to the rafters, as may still be seen on the so-called Temple of Concordia in Akragas, (An opening at the middle of this upper wall permits access to all the attics and makes possible an unrestricted inspecition of them), or on the side walls of the cell, which might also have been extended up to the rafters, to serve as a support for them instead of a purlin, as Hittorf restores Temple F at Selinus, for example.

A construction with horizontal rafters, as assumed by Viollet-le-Duc and also by Hittorf for another temple, and which has always been used in the South until the present time, may have likewise existed.

Sheathing appears to have never been used; the tiles were then either hung on horzontal purlins by their projections, or

were directly laid on the upper surfaces of inclined rafters.

A ridge purlin and two roof purlins were assumed in Phigaleia, which rested on the different pediment walls; on these lay the rafters resting against each other at top, cut in dove-tail form at the lower ends and resting in seats cut in the geison.

The rafters were placed about 2.08 ft. between centres; the height of the roof in most temples amounted to between 1/7 and 1/8 the width of the temple measured above the architrave.

Since the rafters did not extend down over the geison, the inclination of the roof must either be worked on this from the ends of the rafters outward, or as was frequently the case, a separate inclined piece must be laid on it, and which then ended in front in the form of an ogee moulding. If cymatiums were carried along the sides, thev were on the inclined pieces; in other cases the roof tiles rested on them.

Interesting points on roof construction are given by various ancient building contracts, which indeed do not primarily apply to roofs of temples, but to those of secular buildings. Here is again the previously mentioned building contract for the Arsenal of Philo. (Lines 45-58). The passage in question runs thus[117]:-

(See Greek text in Durm).

Note 117. In Corpus Inscrip. Attic. II. 2. No. 1054. Berlin, 1888.

160. Translated in to German and thence into English:--

"Set capitals of Pentelican stone on the piers. On these rest wooden architraves, which are fastened to the pieces and are 2.5 ft. wide and 2.25 ft. high, measured from the highest point, 18 in number on each side. (The architraves, which are regarded as purlins, are dressed off on top to the slope of the roof). Place intermediate beams over the middle passage on the piers, equal to the architraves in thickness and height. On these lie longitudinal beams (here ridge purlins) 1.75 ft. wide and 1.75 ft. high, exclusive of beveling, under which are wooden caps 3 ft. long and 1.5 ft. thick. The purlins are to be fastened with pins on these and on the intermediate beams. On these rest the rafters (sphekiskoi) 6.35 ft. high and .94 ft. wide, at distances of 1.25 ft. apart; then longitudinal strips (himantes) .50 ft. wide, .125 ft. thick and .25 ft. apart; lastly, on these are to be boards (kalymmata), .06 ft. thick and .38 ft. wide, fastened by iron nails; after these are coated (dorosas, with

clay and straw), the roof will be covered with Corinthian tiles, one tile locking over another."---[118]

(Note 118. Bohn's translation (in Cent.d.Bauw. 1882, p.295-296) skips some important words, especially "dorosas", the covering of the sheathing of the roof (with clay and straw). "Pier" is preferable to "column". The restoration of the section is not satisfactory and not acceptable.

We deduce from this that the roof was constructed with inclined rafters, and that in the three-aisled interior the vertical supports of the purlins were stone piers, that the arrangement of a ridge-purlin resting on a wooden cap and the strong transverse beam beneath this was chosen, and that the feet of the rafters did not rest on a plate, but were let directly into the ashlars of the geison; further that on the rafters was laid a sheathing coated with clay, on which the clay tiles were set (see Fig. 123, after Choisy's restoration[119].

Note 119. With the restoration by Choisy, that published by Fabricius mostly agrees. (Die Skenothek des Philon, das Zeughaus der Attischen Mahine in Zea. Hermes, Zeits. f. class. Phil. 1882, p.551-594). The clear and exeellent interpretation of the text, which Fabricius gives in his essay, will be read by every practician with pleasure. Except that the surprising statement is made (p. 582); "It is well known that no other mode of fastening the tiles, especially that by nails on the rafters, occurred in antiquity",-- while yet the Lex Puteolana expressly requires the nailing of one row of tiles with iron nails.

Less clear is the case in the contract ofor the restoration of the Athenian Walls (Corp. Insc. Attic. II, 1, No. 167), which Choisy (in his study:- Les Mures d'Athenes. Paris 1884) treats in a truly ingenious but not entirely satisfactory manner. He takes up the matter as too beautiful and too artistic, when it concerns the repairs to a fortification, that has fallen. Therefore his translation and interpretation of lines 63-73 do not correspond to the Greek verbatim. As far as the top of the wooden ceiling (See Fig. 104), he may be followed, though not without objection, since it is not definitely stated, that the pier must be carried to the same height as the wall, and a projection of the beams beyond the wall and piers is not specified. But in the passage (See original in Durm) occurs an interpretation, which

it is still harded to accept. He arranges work that can only beperformed after that described later is completed. He first requires on the beams of the ceiling or roof a superstructure of unburnt bricks or pise, and after this the substructure, i.e., the supporting sheathing and the beams to prevent sliding. But the addition of the rather modern, bomb-proof, mass of earth (M in Fig. 104) above the woodwork of the ceiling is not mentioned in the specification, and this work is so great and so
161 important, that one would not have forgotten to mention it.
162 Choisy assumes all succeeding [illegible]work to be on both sides; but nothing of this likewise remains in the building contract. This double work would not have been omitted by a Greek in the letting of work.

C.O.Müller assumes a shed roof instead of Choisy's gable roof, and longitudinal beams from pier to pier instead of the transverse beams, which corresponds better to the conditions according to our opinion. The passage cited reads as follows, plainly translated:--

----"After he has made ready the wooden framework of the ceiling, he will set on the wall the straight geison of the cornice, projecting sidewise 1.5 ft., and will set on this the upper piece of the cornice (akrogeison), true and plumb, 7 ins. wide, 1 palm (handbreadth or 4 fingers = 3.5 ins.) thick while he cuts out on the inner side the thickness of a board and dresses off the top in accordance with the slope of the roof. He will lay on the inside boards 1 in. thick and 5 ins. wide with intervals of 3 palms (10.5 ins.), and (fasten them) with iron nails. And after he has thrown upon them plastering reeds (dry reeds, the canna of the Italians) with an under layer of chaff (pieces of reeds or chopped straw) or reeds, he will cover this with a layer of clay mixed with straw to the thickness of 3 ins. And he will cover the entire extent of the enclosing walls with Laconian tiles, and he will set the hegemones, where they are wanting, entirely in clay, flush with the face of the wall. And he will set the covering tiles entirely on a bed of clay.

And he will mould the outside with a Corinthian cymatium, while he trims off the ends of the beams properly, and sets the former exactly in the plane (of the wall) and plumb ---".

In the now defective inscription is also mentioned a coating

with clay and straw, though this work does not appear in the details. Choisy's drawing could scarcely be derived from this, and we are then poorer by one idea in construction, by the tile roof without rafters, which is likewise followed by Dieulafoy, and has its result in the convex clay and straw terrace roof of the early period.(Franccis vase). But here is likewise certain the "dorosei pelo ekuromeno", .. the covering of the sheathing with clay and straw and the bedding of the tiles in this.

102. Covering of the Roof.

The most primitive covering of the roof was that with clay and straw, which was succeeded by that with burned tiles, employed everywhere for the older temples; their form and the system of tiling was the same that is now common in southern countries; large flat tiles (imbrices) with edges curved upward at the sides were laid side by side, and the joint was made watertight by covering it with a cover tile (calypteres).

The clay tile roof was followed by the marble roof; the system and forms of the former were transferred to the latter[122].

Note 122. See 41 Programm zum Winckelmannsfeste der Arch.Ges. zu Berlin. Berlin, 1881. p.16-22.

103. Earliest Clay Tiles and Cover Tiles.

The slightly curved bed tiles with semicircular cover tiles are to be regarded as the earliest form of clay tiles and of their system, which were laid just as on mediaeval roofs, or as today on common Italian hollow tile roofs. Flat tiles with projecting water-drips were then used along the gutter, and these were firmly held by nailing to the rafters.[123]

Note 123. Compare Lex Puteolana and the corresponding passages in the succeeding volume of this Handbuch (p.205, Art. 190).

The dimensions of the tiles vary in width from on an avaerage between 1.31 and 1.64 ft. and in length from 2.62 to 3.61 ft. Their upper surfaces were frequently covered by a fine skin of
163, finely washed clay, left in its natural clay color of light yellowish gray or reddish, as shown by specimens from Olympia, Argos, and Mycenae. The tarring of tiles in Epidauros is authenticated.[124]

Note 124. See Baunack, J. Aus Epidauros. p.88. Leipzig, 1890. Inscription, line 239:-- Timasithoesi pissasios ton keramon--- 60 drachmas 5 1/2 oboli (1 drachme = 4.36 grams of silver).

A slightly curved tile found near the Kerameikos in Athens is 1.67 ft. wide, 3.28 ft. long, and 1.57 ins. thick, made of light yellow clay, and it has two imprinted stamps, the upper one containing the words " SOKLES ARCHITEKTON". The light yellow clay is found in manufactured articles, both in the Greek mother country, as well as in the colonies.

104. Flat Tiles with Cover Tiles.

The curved tiles were followed by the plane flat tiles with sides turned up, whose devices for jointing exhibit the greatest diversity. But with the covering of the plane tile, the cover tile likewise changed its form; more commonly they were burned in a single piece with the former (see Fig. 108, fragments from Athens and Olympia). The sloping form of the cover tiles must form the half round space, so that these slopes were plane or curved, as shown by different examples. A piece of the former was coated with dead gloss red clay, as found on Samian pottery; others exhibit a clay more like Sienna, and painted or relief ornaments heightened by color.

105. Repairs.

Broken tiles were considered worth patching, as shown by pieces in Athens, where cracks are held together by small lead cramps. So-called riveted tiles were made known by Koldewey[125] for Assos, Olympia, and Khorsabad.

Note 125. Die Antike Baureste der Insel Lesbos. p.46. Berlin, 1890.

106. Peculiarities.

Peculiarities in preparation are shown by some fragments of Athenian marble tiles, whose surfaces for the running water are smoothly polished, while their margins, joint surfaces and joint bands, as well as their backs, are roughed out, the joint bands bearing setting marks in the form of letters, and which are also similarly found on marble tiles in Epidauros (Fig. 124). A fragment of an Athenian marble tile shows a narrow band set off by a line, in which are found two blind holes for pins.

Fragments of antique roof tiles were found in Ephesus near the Artemesion (now preserved in the British Museum in London, one of which comes from the older Temple, burnt 338 B.C., and the other from the rebuilding commenced by Deinokrates), which have the so-called hooks on the lower side. On the fragment from the later Temple, this projecting hook (3.54 ins. wide, 2.95 ins. long, and .98 in. high) is placed close to the left upper corner, at the side,

but .59 in. from the upper end. Since a second fragment of the right upper corner of another tile has a hook at exactly the same place (Fig.125), the complete tile must have had two hooks at top.[126]

Note 126. Compare Puchstein in Woch.f.Klass.Phil. 1890. p. 1409-1410. -- What is further said there on this point is not entirely clear technically. Boorman remarks in reference thereto, that the Ephesian fragments "attest marble tiles with hooks, which may only have been intended to hook on horizontal strips".

For purposes of ventilation and lighting, special pieces were made for both the tile and the marble roof, examples of which may be found in the succeeding volume of this Handbuch (Figs. 198, 199, 291, p.220, 317).

164. 107. Ridge Tiles.

The ridge was either covered by large cover tiles, in whose
165 sides the other cover tiles were inserted, or a kind of mouth-piece was allowed to project from them, into which the ends of the cover tiles entered, or saddle-shaped cover and flat tiles were bent up at the ridge according to the form of roof, thus protecting it in an excellent way. The continuous cover tiles were grooved together; the joints were often made especially prominent by rolls (Olympia, Selinus), and on their crests were again placed palm leaves parallel to the eaves (Figs.119, 126[128]).

Note 128. Compare Olympia, Treasury of the Geloans, Selinus, also Figs. 126, 54, 55, p.60, 61, of the succeeding volume of this Handbuch, where the mode of painting these fragments is given, as well as Jahr.d.Kais.D.Arch.Inst. 1887. p.69-71.

108. Antefixas.

On roofs without water gutters along the sides, the cover tiles were brought forward to the front end of the drip tiles, and the latter then received a disk-shaped decorated plate to conceal or close the opening. These antefixas or vertically aspiring anthemions were repeated at short intervals and ornamented the eaves of the side in the most beautiful way. They were later, as on the Parthenon, independent of the cover tiles, arranged without any connectiin therewith, therefore serving for no particular purpose, but were merely of an ornamental character. On roofs with collecting gutters, antefixas are more frequently placed on the cymatium, which results from structural reasons in order to conceal the joint between two adjacent pieces of the cymatium by lengthening

the cover tile to the upper edge of the cymatium,[129]. (See Fig.122.

Note 129. See interesting examples of terra-cotta antefixas in &-- Campana, G.P. Antiche Opere in Plastica. Rome. 1842. -- Also ornamented antapagmenta (facing plates) and antefixas with entire figures from the Temple in Alatri. (Bassel. Neue aufgefundener Tempel in Alatri. Cent.d.Bauw. 1886.p.197-207).

The Attic monuments of the era of Pericles had marble tiles only, which are also particularly mentioned by Pausanias; he says in regard to the Temple of Zeus in Olympia, that the roof was not covered with burnt tiles, but with Pentelican marble cut in the shape of tiles, a procedure first introduced from Naxos by Byzes.[130].

Note 130. The industry of cutting roof tiles from marble must have been native to Naxos at certain periods, according to recent investigators. The remains of the tiles of the Temple of Zeus found in Olympia (thus opposed to the statement of Pausanias, Book V, Chap.10-13), and also the fragments of the tiles of the buildings on the Acropolis of Athens erected before the Persian invasion, were of coarse-grained white island marble, like that furnished by the ancient quarries on the northern end of the island of Naxos. The roof tiles of the Parthenon and of the other buildings erected on the Acropolis and in the city of Athens after the Persian era were made of the lower white Pentelican marble, the upper surfaces of these tiles appearing to have been sawn, and the lower to have been chiseled. (See Lepsius, G.R. Griechische Marmorstudien. From the appendix to Abhand.d.K.Preuss.Akad.d.Wiss. z.Berlin. 1890.)

17). Dimensions of Temples; Symmetry, Proportions, Unit of Measure.

109. Length of Facade.

In regard to the magnitudes of temples, it may be briefly stated in conclusion, that a majority of the houses of the deities do not exceed a certain average size of about 78.74 to 98.43 ft. for the facade (end), so that on very many monuments, the details described do not differ much in dimensions.

But the given average length of facade is also reduced to one half or is increased to about double, so that for example, the Temple on Egina was repeated about four times in the dimensions of the Temple of Zeus in Akragas.(Fig. 127).

Here occurs an important difference in the dimensions of the capitals, the triglyphs, the geison, etc., and yet the same forms are always retained, and then sometimes suffer an exag-
166. geration to the colossal, sometimes a reduction to the delicate. The small annulets on the echinus, the regulas and drops, the treatment of the triglyphs, the mutules, and the geison on the small Temple on Egina are entirely similar in form to those of the giant of Akragas.[131]

Note 131. Wherever the Temple on Egina is mentioned in the preceding, that one located on a high hill of rock is meant, called the Temple of Athena (by an earlier reading dedicated to Zeus Panhellenios), from which came the famous pediment statues preserved in Munich. Of the so-called Temple of Aphrodite located on the seashore, only the shaft of a column without its capital is now standing.

For lack of something better, the designation of the temples in Selinus by letters assigned by Hittorf will be retained, thus A to D for the temples of the Acropolis, R, S and T for those of the eastern plateau, for which Serradifalco later introduced the letters E, F and G(likewise Benndorf in Die Metopen in Selinunt).

For sake of brevity, the names of the locations of the temples are frequently employed instead of the often very doubtful appelations of the temples.

110. Symmetry and Proportion.

What we understand by good proportions of a building was designated "symmetria" by the Greeks. From this we have derived the word "symmetry", but which signifies something entirely different; for a building may be symmetrical according to modern ideas, but does not therefore require to have good proportions.

111. Theory of Proportions.

The foundation of the theory or principles of good proportions
167. in Greek architecture has already greatly busied our learned men and practitioners.[132]

Note 132. In this connection should be mentioned:--

Viollet-le-Duc. Dict. Rais. de l'Arch.Franc. etc. Vol.7. p. 532-536. Art. Proportion. Paris. 1864.

Viollet-le-Duc. Ent. sur l'Arch. vol. 1.p.395-406. Paris.1863. ---"It would cause deception to believe that proportions in arch-

architecture are the result of instinct. There are absolute rules and geometrical principles."--

Aures. Nouvelle Theorie deduite du texte meme du Vitruve. Nimes. 1862.

Henzlmann, E. Theorie des proportions appliquees dans l' architecture depuis la XII Dynastie des rois Egyptiens jusqua XVI siecle. Paris. (Reviewed by A. Zeising in Allg.Bauz.1863, Literaturblatt, p.31-38).

Pennethorne, J. and E. Robinson. Geometry and Optics of Ancient Architecture. London and Edinburgh, 1878.

Dumon, K. Le theatre de Polyclete, reconstitue d-apres un module. Paris. 1890.

According to ancient procedure, it would be required that the design for a structure should once be made and laid out in all its details according to fixed numerical ratios, which work must then be followed by corrections demanded by the best point of view for the observer of the building in reality, i.e., after its completion, by the laws of optics, by the immediate surroundings, etc., for design and execution are not always concealed in the effect. The originally firmly fixed dimensions of the building thereby suffer small changes, for some parts must be made smaller and others larger. Plato says with this meaning:-- "Were an artist to conceive the beauty of a monument to depend on the exact carrying out of symmetry, he would only have to consider that the higher parts thereof seem smaller and the lower parts larger, than are required to produce perfect harmony. The true artist therefore neglects the requirement of rigid truth, based on the execution of exact symmetry, and adopts in the image of his work proportions and irregularities, which satisfy the requirements of beauty in appearance, even if the requirements of truth must thereby be neglected.

If the procedure in antiquity was in accordance with the statements of Plato, we do not in our geometrical drawings of antique buildings have before us the original symmetrical designs, but the corrected ones, or to exaggerate, the caricatures of the former. In order to find the key to the symmetrical numerical ratios, we must then correct the drawings with reference to the local and other conditions, which at the time determined the correction of the symmetrical design, but which in most cases must have its own difficulties! Most of the attempts to discover the

key by the methods of triangles or squares, or by the module, (when sometimes the lower and sometimes the middle diameter of the column is taken as the unit), indeed for the given reasons lead to no uniform result. The most recent attempt of Dumon, (Theatre de Polyclete) to discover the module of Polycleitos likewise does not overcome these difficulties, and he finally consoles himself with the principle, "that for the purpose of beauty or even of utility, artists departed from the accurate drawing in the execution", and Chipiez (Revue Arch. Serie 3, Vol. 7, p.93-99, 1891) adds in his review of Dumon's work, that just to variations from the rule, do the greater part of Gre-
168 cian architectural creations owe their grace and beauty. As soon as the required corrections are omitted, one has to do with a work, whose esthetic worth is no higher than that of a building, constructed by an engineer according to a "formula".

We may therefore repeat and aver that the two principles, according to which Grecian architects labored, were first the preparation of the design with harmonious proportions, and next the correction of this on the basis of the peculiar conditions.

112. Unit of Measure.

Just as the derivation of the rules for proportions from the executed buildings may lead to doubtful results, it is equally dangerous to desire to accurately deduce from the completed structures the unit of measure employed as a basis for them. On the one hand, we do not know how far the executed dimensions (widths, lengths and heights) accurately corresponded to the dimensions written on the designs; on the other, the dimensions of the parts of the building that should be alike according to the design are frequently unlike in execution, and which part may then have the true dimensions, for example, which of the unequally high columns of the Parthenon agrees with the dimensions of the design? On the great Altar of Hieron II in Syracuse, the stylobate is 71.5 ft. wide on the north side, while the corresponding dimension on the south side is 74.1 ft., thus showing a difference of 2.6 ft.; from which of the two numbers, which were certainly written on the plan, shall the unit of measure be deduced?

Who would succeed today in accurately determining the length of our meter (or foot) from our buildings, if large dimensions

in whole numbers on the plans were alone available for reference! The fact is therefore perceived that scales are not alike on all buildings, that they consist of materials differently affected by the influences of temperature, from which result the differences in laying out dimensions, etc. Inequalities might be pardoned, but not mathematical accuracy!

b. Curvature of Horizontal Lines.

113. Origin of the Theory.

The same feeling that required the entasis of the columns may have made a curvature of all horizontal lines on the building necessary. A passage of Vitruvius (Book III, Chap.4), w which relates to an arrangement on Roman Ionic temples was applied to the differently treated Grecian buildings, and made the most of for the benefit of the preceding principle.

"But if a podium is to be made around the temple on three sides instead of the steps, it must then be arranged with reference to this, that the massive foundation, the stylobate, the body of the building, the main cornice and the cymatium, may be in accord with the podium itself, which is beneath the bases of the columns. The podium must be so leveled as to receive an elevation along the middle by oblique supports (scamilli impares); for if its surface were made absolutely horizontal, it would they appear concave or trough-shaped to the eye. But how the substructure and the little supports are to be made to correspond to this will be further treated at the end of the Book", --- though this promised explanation has been entirely lost. Hence this passage of Vitruvius, by its
169 want of clearness and its incompleteness, has repeatedly and
170 especially in the last decades given occasion for multifarious researches, discussions and interpretations.

The makers of sketches and measurements in the last century took no notice whatever of this expression of feeling end of the hints of Vitruvius. First after the emancipation of Greece from the Turkish yoke, when the ruins of antique temples became more accessible, commenced the more accurate researches on the ancient monuments; these were first due to the assiduous German architects, who were employed in Athens under King Otho.

Essays already appeared in the Allgemeine Bauzeitung in the

year 1838,[135] written by Hoffer, then Architect of the Greek government, in which it was stated that the entablature of the Parthenon was not horizontal, but that the architrave appeared to be lowered at both angles, while all vertical joints still remained close. The same ocurred on the Theseion, where all curved lines were parallel to each other, their rise amounting to from 1.57 to 1.96 inches for spans of 104.17 and 44.98 ft. Besides this curvature, there existed another directed towards the temple, whose versed sine was also 1.96 inches.

Reports by the Englishman Pennethorne containing the same opinions appeared in the year 1846 - 7, and in 1851 were published accurate measurements by Penrose of the Parthenon, the Propyleion, and the Theseion. In the very meretorious work by the latter are recorded all defects in workmanship, injuries and faults in construction, and the deformationr, which the structures have suffered in the course of 25 centuries; since they form the nucleus of the publication, the existing curves of the stylobate and of the architrave on the Parthenon and Theseion are treated with especial predelection.[136]

Note 135. Hoffer, J. Das Parthenon zu Athen, in seinen hauptheilen neu gemessen. 'A contribution to the Theory of Construction of the Temple by the Greeks.' Allg.Bauz. 1838, p.371, 579,387.

Note 136. The level survey of the ast and west sides of the Parthenon undertaken by the author in the year 1879, agrees in general results with that of Penrose. It exhibits the similar high rise of the courses and particularly shows what is most important, that the four angles of the stylobate do not lie in the same horizontal plane (Fig. 128).

The southeast and southwest angles, which are stated by Penrose to be higher than the northwest and northeas angles, were so found, although according to the author, those halves of the courses extending from the middle to the southeast and southwest angles are somewhat flatter.

The curve is divided in two parts in reference to a horizontal (since their origins do not lie at the same height) has the maximum rise of 3.15 and 3.46 inches for a chord length of 101.5 ft. and a minimum rise of 1.65 and 1.10 inches.

The existence of the curved lines on the buildings and parts of

of buildings mentined is a matter of fact; the statements given have been doubted by none of the later investigators, who have entered upon the question whether this curvature was originally intended, or was caused by inadequate construction, or in time by force of accidents.

114. Present Condition of the Parthenon.

On the foundations or the substructure of several steps, on the columns and colonnades, on the triglyphs and matopes, one is reminded of the foundations of the Parthenon carried to different depths, of their construction with different materials, partly capable of slight resistance, of the unequal pressures of the coursed steps of the superstructure, of the positions of the columns on two blocks of stone, of their different heights, distances between axes and inclinations, of the metopes and triglyphs not equal among themselves, to which are added numerous other small irregularities, as for example, the circumstance that the regulas and drops are not always placed exactly beneath the triglyphs, that the abacuses of the capitals do not
171. have the same size, often varying in width about 3.53 inches, (6.831 to 6.545 ft.), and such different forms of echinus are exhibited, also that drops and pieces of mouldings are found cemented in, that the four angle columns are not of equal he height, etc.

The defects were certainly only very small, and scareely another building of ashlar masonry in the world, of ancient or modern times, may exhibit as few faults and slight defects in construction as the technically perfected Parthenon, though affected by the imperfections of human powers. Let one but compare in this way the construction of the best structures of the Roman, or even of the Renaissance period. Yet these small faults are avoided with difficulty and do not lessen the worth of the building; it would be erroneous to rate this lower on their account, but it would be equally erroneous to explain these faults as being particular refinements, to discover them, and conceive that their explanation was lost to us.

But besides these small original irregularities, there also occur other deformations arising in later times, and demolitions of the most varied kind. In the course of more than 2000

years, the building has served for the most dissimilar purposes, for the pagan house of a deity, for a Christian church, and for a Turkish mosque.

The marble ceiling of the opisthodome fell in the year 1403; in 1687 a bomb from Morosini's besieging troops fell in the Parthenon, in which the Turks had stored their powder, and exploded this, shaking the structure to its foundations and scattering the blocks of marble as far as the Museum hill. Elgin and Lusieri pillaged the triglyph-frieze in 1801 = 3, destroying the geison; the building had to endure a violent bombardment in 1826 - 7. "The three common enemies of antique art, Turks, Englishmen, and gunpowder", have also pretty effectively labored here. The external surface of the marble is now everywhere corroded; in consequence of the occurrences described, the steps no longer exhibit any sharp angles or plane surfaces; the stylobate has been much crushed by the falling stones of the cornice, especially at the angles, and other blocks were moved from their original beds by the force of the powder; the columns are in great part overthrown, the separate drums of those still remaining upright being twisted from their original beds (Fig. 129), and the cella walls and columns along the sides are overthrown; the architraves are much injured in several places, especially near the angles, the cornices have gaps and are interrupted, and the pediments are but partially preserved. If some portions are still well preserved, with the exception of the everywhere injured external surfaces, the material has resisted the influences of the weather in great part, and the end and bed joints of some blocks are still very close[137], yet an excellent state of preservation of the monument, as frequently asserted, is entirely out of the question.

Note 137. This is in many places ascribed to incrustation in the joints.

An attempt at restoration made in 1841 - 2 had as its object the reparation of numerous injuries, since with good intentions two entire columns were rebuilt on the north side and others half-way, only the drums of others being raised upright, and the northern cella wall was partially rebuilt.

115. Refutation of the Theory.

The heterogeneous foundations, the various irregularities in

construction, the fact that the four angles are not in the same plane horizontally, the shocks and distortions that the building suffered, the cracks in the architrave, the partial opening of the joints of the ashlars of the stylobate, the jagged projection of some in front of the face line, and the irregular form of the curve, do not permit the assumption of an originally intentional construction of the now horizontally curved horizontal lines. The condition of the building as described no longer permits it to be determined with certainty whether certain unusual and peculiar appearances were intended, or existed on it 2330 years ago. Also the difficulty of constructing such curves, and the consequences resulting therefrom for other portions of the architecture, with the actually invisible effect of this, since the ratio of its rise to its span is very small, and it chiefly lies below the horizon on the substructure, and on the architrave is intersected by the abacuses of the capitals and becam quite without effect, these would oppose an intentional arrangement, which would on the other side be answered by a denial of the difficulties. If the construction were so easy, why did not the masters of technical skill then succeed in executing it with regularity? Why could not the first requisite for an isolated and not very large building be once satisfied, and the four angles of the building be placed at the same height? But if the establishment of a curve was intended by the architect, it must then be said that this experiment has resulted quite too miserably and may be characterized as anything but successful, especially if considered as disproportionately enlarged, and not in accordance with its actual insignificance. For finally, what signifies 3.30 ins. or less that 1.18 ins. rise at the middle of horizontal lines respectively 229.66 and 101.72 ft. long, whose continuity is moreover interrupted at the centre by inserted steps for ascent? The jointing of the stones and the entire execution, with all the small defects described and which are inherent in the latter, is nevertheless so perfected, that it would be difficult to pass off as intentional such an imperfectly and awkwardly expressed arrangement as the present curves, if we were willing to accept them as original. For the honor of the Greeks, and on the basis of the evidence cited, we

will let the former pass current in a higher degree for the beautiful Theseion in the face of the much discussed curves of the stylobate, (Fig. 130), as we must likewise ascribe to changes in the ground the different heights of the stylobate of the Heraion at Olympia, where the execution is certainly less refined. Other Doric temples were indeed likewise free from this line of beauty, only "perceptible by the feelings".

173 A peculiarity in regard to the original curvature, that still remains to be mentioned and affords opportunity for consideration, are the different dimensions of the lowermost drums of the columns; men are commonly inclined to deduce from the unequal measurements occurring on them conclusions in favor of original (curves).

Measuring on the surface in a plane passed through the centre perpendicular to the cella walls, there are found for the separate drums(which, as previously stated, were not of equal height, their heights frequently differeing about 5.50 ins.) greater heights on the external surface than on that towards the cella wall; these differences first result from the fact that the pavement of the portico is laid inclined, and they are increased by the inclination of the columns towards the cella wall. But measuring in a plane passed through the centre parallel to the cella wall, differences in measurement are again found on the surfaces of nearly all columns, so that on the pediment ends, for example, the lines on the southern sides have heights differing from those on the northern sides. It is evident that the differences are not great; they lie between the limits of 0.00 and 0.47 inch. Since the larger variations in measurements are mostly near the angles, an appearance might be produced, that it was intended to arrange by the irregularities in this direction an adjustment of the upper surfaces of the drums to the horizontal, and thus render possible a vertical position of the axes of the columns on them. The uppermost adjusting drum would then cause the flatter curve of the architrave.

If one here assumes it to have been the actual and sole intention of the architect of the Parthenon to build with reference to an adjustment of the drums to a horizontal, we must

then again declare that he only succeeded in this in a very imperfect way. An earlier drawing (Fig. 74) even made the divergence of the axes apparent; (theoretically constructed, tho-
174 ugh never really apparent); the measurements of the drums taken in this direction exhibit the following differences (excluding the angle column).

	II	III	IV	V	VI[138]	VII	
E.side.	0.473	0.354	0.118	0.000	0.118	0.473	inches.
W.side.	0.394	0.197	0.079	0.197	0.275	0.275	inches.

Note 138. Dimensions for VI have been corrected and made plus instead of minus as before. See Note on p.169).

It would appear scarcely permissible to desire to establish a constant and uniform increase or diminution of the difference numbers to the right and left (of the centre) in favor of a system.

With a diameter of the lower drum of about 6.562 ft., and w with the previously described mode of bedding and setting it on the inclined surface of the pavement, a possible displacement of a few tenths of an inch (in places only 0.079 inch) to one side or the other cannot be regarded as intended for a definite purpose. But it must not be forgotten here that many drums were also displaced by the explosion.

Assuming an intentional curvature of the horizontal lines, the front surfaces of the triglyphs and metopes at the four angles must have angles other than right, yet this is not found to be true on numerous measured pieces. With such a very flat curve and such a loose connection of the metope slabs, a decision in regard to these angles at the corners would originally have been made with difficulty, since the variations must have been quite minute. Now when the architrave on which rests the triglyph-frieze is broken, and the building has suffered much by violent injuries and from decay, nothing certain can any longer be stated concerning this, and positive statements about the angles in question, such as are occasionally made, are to be very cautiously accepted under these conditions.

It must always remain meritorious that Penrose permanently determined the minute differences in measurement and the irregularities on the buildings; but I cannot defend the various

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optical and perspective-esthetical studies and principles, which were deduced from these, and some of which are even ridiculous.[139] The occasional representation of the actual measurements by abstract numbers is only to be regarded as an eccentricity.

Note 139. Most of these are not based on a survey by the author concerned, but on unlimited faith in the three and four figure measurements of Penrose. I have elsewhere shown in regard to this, that his statements do not in all cases correspond to the actual conditions on the building, and that he represents things as better than they are in reality. I have to add that many parts, whose dimensions he gives, in general no longer exist on the building and also could not have been in existence 30 years since. Thus, for example, on the west side, the dimensions of the front surfaces of the abacuses of the 1 st, 3 d, 4th, 5th, 7th and 8th columns (taken from north to south) are no longer to be determined, as well as those of the regulas and drops beneath the 5th, 6th, 7th, 8th, 9th, 11th, 13th and 14th, triglyphs, since these were shot away in the bombardment in 1826-7; likewise those of the 5th, 6th, 7th, 8th, 10th and 11th metope slabs, as well as those of the 7th, 8th, 9th, 10th and 11th triglyphs.

On the southwest angle column (thus the 8th column)of the western pediment, the edges of the flutes no longer fit on each other; hence the column or the different parts thereof are no longer on the old location; the five lowest drums still harmonize; the higher ones indeed harmonize with each other, but differ from the lower ones. This condition is shown in a greater degree by the columns of the eastern front; the northeast column and the next one have strongly displaced drums (see the corresponding Figs.), as well as the 5th and 8th (from north to south).

No longer to be determined, since they exist no more, are the measurements of the fronts of the abacuses of the 3d, 6th, 7th, and 8th columns of this side, of the southeast angle of the architrave, of the 7th, 11th, 14th and 15th regulas and drops, or of the southeast angle triglyph.

Of the 13 columns of the southern side of the Theseion, but a

single one has remained in position; in all others the drums are irregularly displaced (Fig. 181), and scarcely one of the many is in its original position; the same occurs in an equally striking way on the next pediment end of this temple. What matters under these conditions the very slight differences on the side surfaces of the columns in the direction of the length (of the temple); a single slight twist to right or left about the axis of the drum would lessen or increase this for the drums with diverging beds.

175 But to wish to see a structural reason in these curvatures, a rule for protection against the effects of earthquakes and the insecurity of the site, must be abandoned; only when constructed in the reverse direction, as in Egyptian foundation masonry, did the curved horizontal lines possess a meaning, although a rise of 3.15 inches for a span of 105 ft. is practically of no value.

An estnetical demand for the curvature did not exist, but in regard to its beauty of effect, one could hold a different opinion.

Krell[140] holds this opinion in his Geschichte der Dorischen Styls:. "Not paralyzed, as some would say, but strengthened by the curved horizontal lines, which were moreover formed in the eye: the beauty of such an effect is questionable and might also be obtained by a nearer approach to the building".

Note 140. Geschichte der Dorischen Styls, etc. Stuttgart, 1870.

If the Greeks also possessed "more uncorrupted" eyes than we do (from the less frequent use of straight-edges, bevels and plumbs!), and saw everything straight as if curved, so that perhaps only curves appeared straight, the curvature was then certainly necessary, when a horizontal straight line was intended.

But if it be proved to us that all the grace and the eternal youth of Grecian architecture consisted in the distorted horizontal lines, which are moreover only to be recognized on a few monuments, we must then still gratefully reject this dogma.

The statement that the scamilli impares of Vitruvius were

transferred to the lowest drum of the columns of Grecian Doric temples, according to the explanations has but a limited value; as repeatedly proved in this case, the divergent beds of the drums are first arranged in accordance with the inclination of the columns inward and with the inclined floor of the portico.

Hoffer[141] believed that a fixed optical law must be accept-
176 ed for the intended curvature, since he states that every long facade appears lower in accordance therewith, and the more so the longer it is, if one stands before its centre and looks toward both ends.

Note 141. Hoffer represents himself in his Beitrag zur Konstructionslehre der Griechischen Tempel (Allg.Bauz.1838. p.371, 379, 387) as being the first, who has "given to his contemporaries a clear presentation of the system of construction of the Parthenon", and his technical explanations and statements are also mostly acceptable and correct. But his wedge, flying-buttress, and curve theories afford reason for well grounded hesitation. The evidence, "that the system of curved lines on the Parthenon was actually based on the design and not on accidents" was not brought forward by him, while he neglects many things, like the architrave destroyed at the angles, the injuries in the substructure, the opening of the joints, etc., and the results of the explosion, while he did not take into consideration a sinking of the building, which was assumed or explained as such by him. He further states that the curve in the third and fourth courses from the top of the substructure loses itself, and that only with the upper angle of the uppermost step does "the complete curve of the construction" appear, to which all homologous lines of the entablature are then parallel, which again does not occur. For the courses turned inward, found by him, and their purpose, the drawing of the horizontals inward about .52 to .79 in., which commences on the capitals and increases up to the last line of the cornice, while the tympanum is again curved back from a true plane, Hoffer can give us no explanation, but these are most quickly accounted for by the deformations that here occurred.

According to him, but a few triglyphs stand exactly plumb;

the different pieces of the frieze were all fitted against each other at discretion, which was the less to be avoided, since almost every one had a different inclination to the vertical.

The deformation in the stylobate, which caused the cracks in the architrave and its changed position, must have likewise changed the position of the triglyphs and of the metopes, set with some play in the grooves.

Therefore these are the less suitable for proof, than the higher mutilated geison. Just as little can the present condition of the pediment induce me to accept, that its upper limiting lines were originally at a slight angle, and were later raised to the correct inclination.

If this inclination toward both sides were exhibited on the building itself, the effect on the observer must then be increased, since the building would appear longer to him than it is in reality. Whether the Greeks may have intended to increase the effect of their temples in this way must be left undecided.

Bötticher explains the curvature of the horizontals as having arisen from the compression of the foundations, built of materials of inferior quality: Hoffer also calls attention to this fact, that on the eastern end (just where it rests on the natural rock and has the least depth of foundations!), it has sunk toward the north, and then raising this sinking again, assumes in his communication an entirely regular curve, which is to be considered an arc of a circle of 7087.84 ft. radius. He fixes the rise of this curve at 2.49 ins., and that on the Theseion (pediment end) at 0.985 in.

But this raising of the angle and the regularity of the curve resulting therefrom are arbitrary and a concession to this theory, as he desires to assume and contrive something in its favor, and so provides himself with it, determined in a peculiar way. We are not authorized to make such corrections, concerning what we will characterize as defects in workmanship, and which are produced by deformations or sinkings.

Hoffer also adds to this and specifies, as did Penrose later, that not all "similar parts of the temple were made ent-

entirely alike with geometrical accuracy, and he even ascertained variations by no means unimportant, which yet made no disturbing impression on the general effect". Small defects and irregularities in the construction, with otherwise perfect jointing of the cut blocks, changes in the ground, deformations of violent character by explosion and bombardment, the decay of the upper surfaces, and the adhering together of the joints of the marble, are described by all investigators, and the condition of the monument resulting therefrom justifies the abandonment of the so subtile theory of curvature. At this time, when scarcely an angle on the building is uninjured, anyone would deceive himself, were he willing to fall into enthusiasm over the effect of curves, and to look for them in the elixir of life of Grecian architecture.

The slight negligencies in the execution, where the beads are in many places omitted above the triglyphs or metopes, or it was forgotten to carwe them in finishing, must be mentioned. But these oversights could be repaired by painting.

116. Curves in Egesta.

A curvature of the stylobate, especially on the sides, is also noticeable on the unfinished Temple in Egesta, whose stylobate has never been dressed off, and rough pitched surfaces of very different dimensions appear on all ashlars. It is as readily visible as on the Parthenon, and especially if the n north side be viewed under accidental light, so that the vertical surfaces of the steps of the stylobate are in half shade and the horizontal ones are in full sunlight. The curvature is here more irregular and greater than on Athenian buildings, and therefore we may still less assume a purpose here.

117. Curves in Pergamon.

An interesting communication is made in the work on Bergamon[142], which we reproduce verbatim.

Note 142. Altertümer von Pergamon. Bd. II. Das Heiligthum der Athena Polias Nikephorus, p.23. By R. Bohn. Berlin. 1885.

"Finally, another peculiarity should be mentioned, the curvature of the horizontal lines in the foundation. The southern front appears to be made entirely level, both the ashlars yet remaining as well as the preparation of the solid rock,

small variations up to .59 in. not being considered, and the courses of the northern front are too much broken to permit accurate observations. But the western front is otherwise; the increase in height here continues from both corners to the middle and is indded uniform in all courses. The maximum of this rise amounts of 2.16 ins. at the centre. That such a regular curve could not have been produced by an accidental sinking is clear. But since the opposite side is too much disconnected to show anything similar there, I can in nowise deduce from this single observation an intended curvature of the horizontals".

On this building, the substructure of the southern side is entirely horizontal, those of the northern and eastern sides can no longer be determined, and that of the western side is curved; horizontal construction and curvature therefore appear in the same structure.

We prefer to adopt Bohn's views, that it cannot here be a question of an intended curvature of horizontals, and just as little and for similar reasons, as on the Parthenon and Theseion. Defects in workmanship are here to be considered as proved by the existence of straight and curved substructures on the same work, and I cannot forbear to refer it to the well-known occurrence in practice, that in setting ashlars from the two ends toward the middle, the workmen came out rather too high at the centre. In setting long courses of ashlars, workmen are rather inclined to have the setting strips rise, that to slope downwards. These small additions for different ashlars are finally added together and produce at the junction at the middle the excess over a true horizontal. Small variations of 1.97 ins. rise for a horizontal distance of 42.6 to 9865 ft. may well be passed by the superintendent of the work, as was assuredly done in Pergamon.

178. 118. Curves on the Temple in Corinth.

On the old Temple in Corinth (see description of its condition in Art. 151), a curvature was likewise discovered on its western side[143], which for a length of 65.7 ft. has a rise of .79 in. at the centre. A similar one is not stated for the long side. With this it should be noted, that an earthquake at an

early time threw down the temple and prostrated most of the massive columns. At the very least, 2400 years have elapsed since its erection, and "the earthquakes of the last 50 years have indeed not injured the temple, but the stylobate under most of the columns yet standing was found to be so ruined, that at a not distant time the complete overthrow of the temple (here should rather be said; of the 7 shafts of columns still standing witheir half fallen and ruined architrave blocks) may be predicted with certainty".

Note 143. Mitt.d.Kais.Deutch. Archaeol. Inst. p.297-308. Athens. 1886-7.

Under these conditions the assumption is scarcely probable, that a deformation has not occurred here, and that in spite of these primitive conditions, an unusual accident may not have dislocated the stones and the solid rock by a small amount or have changed their position. But we will for the moment drop the possibility of defects in workmanship and ask whether the discoverer of the curvature really believes the foundation of a building to be actually unchangeable, if it stands on the solid rock? Why might not a sinking occur, when the lowest step of the temple is cut out of the solid rock? Mediaeval and even other architects frequently held the solid rock to be truly unreliable, and exactly to the fact that the Friedrichsbau in Heidelberg is founded on the solid rock is it to be ascribed, that the two principal facades have been considerably separated from each other by the widening of the cracks in the solid rock in consequence of admission of water (thus not at all by suddenly occurring natural accidents).

So much is now assured, and this will also be felt and must be conceded by the friends of intentional curvature, that in the present conditions of the temples considered, and after all accidents that have happened to them, especially at the Parthenon, where the stylobate ashlars were in part moved from their beds and the drums of the columns were forced outwards, the curves now existing are not at all any longer the original ones. By this fact is the basis withdrawn from many theories, and for anything further, we may satisfy ourselves by a reference to the worthlessness of horizontal curves to every prac-

practical architect in Maertens.[144]

Note 144. Der Optische Masstab, etc. 2d edit. Berlin. 1884. In reference to curvatures, also see Durm, J. Die Propyläen von Athen. Zeit. f.Bild.Kunst.p.294-296. 1884.

119. Scamilli Impares of Vitruvius.[145]

In reports on the excavations in Sunion[145], Dörpfeld calls attention to the fact, that under two columns of the portico on the stylobate on the northern side wedge-shaped drums of columns of very slight height (1.97 to 0.0 ins.) were found to be placed, which were moreover not employed to give the axes of the columns an inclination inward, but to make the surface of contact of the column and stylobate horizontal. Further, this arrangement did not exist on the nine columns of the southern portico. But this leveling did not here occur in a plane parallel to the wall of the cella, in the manner elsewhere referred to Vitruvius, but in one perpendicular to
122 this wall, which was necessary, since the pavement had a fall from the base of the wall to the face of the uppermost step of the stylobate.

Note 145. Mitt.d.Kais.D. Archaeol.Inst.Athens. 1884.p.324-337.

The inclination of the pavement of the portico has also been proved elsewhere, and therefore this statement is not to be doubted. Dörpfeld sees in this arrangement the scamilli impares of Vitruvius, which interpretation will be readily accepted by every technician, although Vitruvius places it quite distinctly and clearly in the plane parallel to the line of the columns.

54 There were practically two methods of equalizing; either bearing surfaces were wrought on the stylobate ashlars, or the scamilli impares were formed on the lower drums of the columns by making their beds divergent. With these scamilli, the slope of the pavement of the portico and the oblique position of the columns could both be taken into account.

Koldewey[146] prefers to have discovered the scamilli impares for a temple in the Ionic style in Messa on two slabs supporting columns. He assumes, since this may have been the case in Priene, that also in Messa the pavement of the portico had no slope, in contrast with Attic buildings. Since the elevation

of the bearing surface above the upper surface of the stylobate is now unequal on all its sides, he infers from this that the front edge of the stylobate must have been "curved", and since these bearing surfaces in a plane through the centres of the columns parallel to the wall of the cella had the maxima and minima of the elevations, they thus corresponded "exactly to the previously unknown scamilli impares of Vitruvius". The two slabs supporting a column comprise an inner and an outer ashlar.

Note 146. Die Antike Baureste der Insel Lesbos. Berlin. 1890.

The Temple in question is built of trachyte-tufa and must have been a pseudoperipteral structure with 8 × 14 columns; but according to the report of the discovery[147], only the two stone slabs mentioned have been preserved. On these slabs are circular marks of location, not completely preserved for their entire perimeter, which rise to different heights above the injured ground of the slabs, almost flush with the ground,[148] or rise above it .04, .047, .118, .157, or in one place .59 in. . But one finds such appearances everywhere on antique ruins, which have their natural explanation in the fact, that the places covered by the shafts of the columns were protected, while the adjacent surfaces were injured by visitors, by cleaning, and still more by the effects of the weather. To the circumstance that protected and unprotected surfaces occur on the same stone and leave the corresponding marks, we owe the possibility of a reconstruction of so many antique monuments; it has occurred to no one till now, to accept these more or less visible or conceivable marks of location for the scamilli impares of Vitruvius.

Note 147. See page 49 of same work.

Note 148. See Plate 22 of same work.

The material is in the present case moreover so uncommonly slight in proportion to the whole, that it may at least appear very venturesome to base such distinctly expressed conclusions on this discovery.

180. Polychromy.

120. General.

The employment of polychromatic painting on the buildings of the ancient oriental nations, the Asiatics and Egyptians, is

well known, and proofs of this are still preserved on the external walls of the Temple on Philae and in the interior of the Temple at Denderah. Pleasure in color itself, which meets the inhabitant of the south in a thousand ways and everywhere in nature itself, may probably have been the principal inducement to transfer it to his structures. "the gay and many-colored flowers and fruits with which Nature adorns herself, appear to invite men to embellish themselves and all their belongings with as high colors as possible" (Goethe).

But the use of color decoration may also subserve practical purposes; building materials with small capacity for durability may thereby receive a protecting coating, and the external surfaces of materials not beautiful may be concealed by it.

The Greeks probably followed Egyptian customs and also Asiatic tastes, when they applied colors of equal intensity on their utensils and buildings as the highest decoration. It is to be ascribed to the perishableness and easy destructibility of those in the open air, that vestiges of them are now only preserved to us on entirely protected portions, often only on fragments covered by rubbish and earth, but these are again in such great abundance, that we are able to determine with almost complete certainty the design of the ornamentation, as well as its colors.

Moreover we also have evidence furnished by the ancient writers. Homer and Euripides speak of colored architecture. The walls of the Palace of Alkinous are described as being decorated by blue garlands; in the "Iphigenia", the golden frieze of the beautiful-columned temple is mentioned, etc.; and Vitruvius permits the triglyphs to be painted with sky-blue wax colors.

Further evidences are the slabs of Pentelican marble found in the right wing of the Propyleion at Athens on the 10th October, 1836, unfortunately broken and incomplete, on which were engraved the accounts for the finishing and ornamental works. We quote from these, for example:-- "To the same men who built the scaffolds for painting the lower portions beneath the roof, to Manis from Kollytos 4 oboluses; to the painters,--to him who 149
painted the cymatium on the inner architrave 5 oboluses per ft. 166 leaves of gold purchased for gilding the shells---(eggs-and-

darts or heart-leaves are probably meant)----.

Note 149. One Attic foot equals 0.2957 m or about 11 ¾ ins. according to Dörpfeld in Mitt.d.Kais.D.Arch.Inst. Athens. 1882. p. 298.

According to Dörpfeld, Mitt.d.Kais.D.Arch.Inst. Atheo. Abth. Athens. 1890. p.170 et seq., the Attic foot actually employed, for example on the Erectheion, equaled from 0.326 to 0.328 m, or was about 12 ¾ ins.

Also in the year 1886 in excavations at the old Parthenon, numerous fragments of the frieze and main cornice of it were found, which were painted in colors and had retained a remarkable freshness and vividness in the earth, and which are still to be enjoyed.

But the best proofs of the original painting are still preserved to us on the Athenian monuments themselves. The Theseion, Parthenon and Propyleion exhibit sufficient vestiges; on numerous interesting architectural fragments of marble or of poros stone coated with stucco, and which are collected in the Museum at Athens, the complete painting is still perceptible. But one should no longer desire to seek for painting on the large surfaces of the columns, the external portions of the entablature,
181, and the cella walls of marble monuments; for the surface of the marble is corroded on those parts exposed to wind and weather; hence a protecting color must have previously disappeared before the surface of the marble could have been attacked. That the golden tone now partially covering the monuments, and which results from a lichen, could have once been exchanged for a coating of color is hard to understand. 150.

Compare Durm, J. Aus Attica. Zeit. Bauw. 1871. p.471, and the conclusions of Landerer and Faraday there stated; also Lepsius, R. Griechische Marmorstudien. p.18, 121. Berlin. 1890.

According to the latter, Pentelican marble is distinguished from other marbles by containing iron (Calcium .5600, Carbonic Acid .44002, and Iron Oxide .00122, making 100 per cent), while again that from the Temple on Cape Sunion by chemical analysis contains scarcely traces of iron in the interior of the stone.

The latter has remained snow-white; the marble of most monuments in Athens is on the southern side white, on the eastern and western sides golden to brown, and has become on the northern side grayish-white to blackish-gray. The beautiful golden-

brown patina must have been caused by the weathering of the external surface of the stone, so that the lime of the marble has been dissolved and removed by rain water, but the iron in the marble has been changed into brown iron (hydrated iron oxide), whose intense brown coloring also plainly appears in the presence of a very small quantity.

On the Olympeion, the yellowish-brown color has chiefly formed on the southern surfaces of the columns and architrave: on the other sides, the marble remains whiter, but is covered by numerous blackish-brown spots. On the Theseion and on the Parthenon, the northern sides have remained almost white, but are covered by spots, while especially the western sides are covered by the beautiful golden-brown patina.

These phenomena are not contested, and the cause why the northern sides of Athenian buildings are colored less brown remained for Lepsius to explain (p. 121); "it likewise depends upon the weather, the rain, and the heat of the sun". Golden colored pieces of marble were picked up on the Acropolis, and I had them examined some years since by Privy Councillor Knop at the Technical High School in Carlsruhe; the absence of iron in the stone was found, and the brown skin must be referred to the existence of a lichen.

Likewise the Sicilian monuments with the architecture of Pompeii, which certainly originated at a later era, still show remains or even complete painting.

It remains to be lamented that investigators in the last century have left us such scanty notes on that point, since they must have then seen much more than those born later.

Researches on this important part of Grecian architecture, the ornamental external decoration, first assumed a definite form in this century, and the first to bring forward the idea of an entire polychromy did not fail to meet with vehement opposition from artists and scholars. An embittered literary warfare arose for ang against the external polychromatic decoration, and continued for many years as a result.

Hittorf made a statement in the year 1823-4 in regard to the Sicilian mounments, and in his magnificent work [151], he supplied the almost conclusive evidence for an entire polychromy. Mean-

Meanwhile the highly-gifted Semper[152] also came out as a champion of the idea and contributed in text and drawings the points essential to a settlement of the controversy.

Note 151. L'Architecture Polychrome chez les Grecs. Paris.1851.

Note 152. Der Stil in den Technischen und Tektonischen Künsten etc. Bd.I. Pls.1, 2, 3, 6, 9. Munich. 1860-3.

French and English investigators like Desbuisson, Paccard, Burnouf, Penrose, etc., are also in favor of the complete painting.

Polychromy on Grecian architecture and sculpture is no longer a question today, to the earlier evidence[153] has new been added in the last decade. From the so-called Persian rubbish of the Acropolis in Athens has it come and now fills the Museum on the Acropolis, and other objects are in the Central Museum there.

Note 153. See the first edetion of this volume, p.118-20.

That portion of this was made known in the most beautiful and complete manner in the magnificent German work "Antike Denkmäler", 182, published by the Kais. D. Arch. Inst. Bd. 1. Berlin. 1890. Pls. 3, 18, 19, 29, 30, 38, 39, which are excellent reproductions of the originals, painted bands, draped statues, etc., where the material with its border strips is painted in a delicate manner, together with cymatiums, Ionic and Doric-like capitals of steles with their colored anthemions, fret patterns, scale and foliage ornamentation.

But the most wonderful and attractive example is preserved on the so-called Macedonian royal sarcophagus, which also decides that marble works of the very highest rank could not dispense with color.[154]

Note 154. Compare Durm, J. Die Makedonischen Königssarkophage. Cent.d.Bauw. 1890. p.329-332. Also Hamdi and Th. Reinach. La Necropole de Saida. Paris. 1891.

The use of materials of different kinds and colors on similar works (architecture and sculpture) anlso earlier produced polychrome, and the highest works of Grecian sculpture are executed in this way. The chryselephantine statues shone in magnificent golden draperies, which in turn were covered with painting or enamelled ornaments (compare the statue of Zeus at Olympia); the naked portions gleamed with the dead lustre of the probably slightly corroded ivory (which indeed of itself acquired a

color in time, similar to the color of the skin of the inhabitants of southern countries, the German red cheeks not being typical of them), the fire of the eye was produced by precious stones set in the cavities for the eyes. (compare description of the Minerva at Megara, the Statue found at Ostia in 1797, the solid eyes of the Elgin fragments of the Athene on the pediment of the Parthenon, and statues and busts in the Vatican, one of which even has inserted silver eye-lashes).

The use of marble of different colors for statues was also frequently attempted and executed with success, being thus a monumental polychromy, that was in the late period compelled to yield place to the commencing perishable work executed with the pencil, and indicates the desire to always see sculpture colored. A similar procedure is to likewise be recorded in architecture. (Also in this respect compare the terra cottas).

To the critics who approach these facts with conceptions of beauty and taste, I might quote Feher's words used on another occasion, that "our vagrant esthetic feeling no longer accords with much that Greek taste liked and approved, but the criterion of feeling is generally most fallacious in questions pertaining to the History of Art".

121. Colors.

The colors employed by the Greeks in their polychromy were not numerous, and were usually placed beside each other unbroken; only the so-called full colors, blue, red, green, yellow, and gold, with brown and black on terra cottas, are used on surfaces and ornaments; pink, pale green, and violet, on draperies of statues; these are sometimes laid on thickly, and are sometimes treated as transparent coatings or like lapis-lazuli.

Besides the triglyphs, the colored decorations of the other portions of the architecture are so small and delicate, that at the height they are placed, they would rarely be effective, unless painted in full colors. This circumstance is not sufficiently appreciated by those, who attack the hardness of the tone; they were also softened by distance and location.

83. 122. Technics.

The earliest monuments were built of porous limestone, and others were of tufaceous trachyte, like the monuments in Assos,

Pergamon, those in Sicily (Selinus and Akragas), as shown by the Temple on Egina and the remains of the old Temple on the Acropolis of Athens. The structure of this material did not permit the production of a close and smooth surface, and made the application of painting directly to the stone impossible. For this purpose, the stone had first to be coated with a ground for the painting, which consisted of a fine white stucco adhering excellently to the porous stone surface, so that specimens of it are still preserved in spite of weather and time. But with all the excellence of this coating, reparations of this stucco coating must have still been necessary from time to time. Hence as a result, men sought a better material, that did not require this preparation and was not exposed to these disadvantages, a and in the best period employed in Asia Minor and in Attica the crystalline white limestone marble instead of the porous conglomerate, shelly, or coarse limestone. For this, a special preparation of the surface by a stucco ground for receiving painting was no longer necessary; this could be applied directly on the smoothly dressed marble, and this was probably a principal reason why no more costly material was retained and sought, th though harder to work and more durable.

As the most costly material, gold, must disappear beneath painting or enamelling, still more readily is one pleased to have white marble covered by color, since it merely replaces stucco in a superior manner.

The application of colors to the stucco ground could be directly made while wet or after drying; the marble surfaces exhibit special preparation therefor. The parts coated with transparent colors (this could not be shown earlier), such as columns, architraves, and walls, were carefully dressed smooth, as well as the delicate members of the decorative architectural portions. The joints on columns and walls, architraves and cornices, were not intended to be visible; they were therefore so carefully made, that they are often scarcely perceptible to the eye; hence a decoration of them by color never occurs on Doric temples.

The gilded portions are characterized by a peculiar smoothness of the surface. In many cases, and this must be the most ancient procedure, the ornamental design was engraved on the

marble, i.e., its outlines were incised and then filled with color: (fragments of this kind are in the Museum on the Acropolis in Athens); in other cases, the ornament was lightly s sketched with the point, the ground being scraped or made somewhat rough, so that the color would adhere better; in still others, the decoration was done directly on the smooth stone with the pencil without previously sketching the form(Compare fragments of both kinds on the Acropolis in Athens). The separate ornaments were later entirely worked in relief and also painted in addition (compare internal capitals of the Propyleion in Athens), which was yet later succeeded by works in marbles of different colors. The blue and green colors covered the marble to a thickness of .039 to 0.59 inch and were prepared with wax (as for example, the remains of the cornices of the Propyleion and parts of other buildings at Athens show) and had no very firm hold on the marble surface. (After scaling off, the blue or green left hardly any perceptible
184 vestiges of color on the marble, while the stains of red penetrated deeply and are scarcely to be removed; compare in this respect the various remains of cornices, as well as the figure in relief, the so-called Soldier of Marathon and other earlier similar[155] sculptured or merely painted sepulchral steles in Athens.

Note 155. Compare Conze, A. Die Attische Grabreliefs etc. Pl. 2. Berlin. 1890.

May one now assume Grecian polychromy on the exterior of the temple to be based on Egyptian tradition, or consider it as an artistic expedient for heightening the effect of the s sculpture and architecture and concealing the unworthiness of the materials, or should one make Architecture, Sculpture, and Painting equal to each other, and say that each one of these would be heightened by the others; still, so much is certain, that polychromy is felt as a need, to not weary the eyes by a too extended mass of white masonry, whose appearance would have been intolerable under the intense light of a clear sky and in the midst of a highly colored landscape.

The warm bright yellow tone that covered the stone temples of Sicily, whose smooth portions were coated with stucco, and which is also found on the cella wall of the Temple on Egina,

permits the conclusion that similar parts were toned in a like manner on marble buildings. "This general coloring could probably scarcely be a thick layer of encaustic colors, as in the case of ornaments, but merely a simple transparent coating, which made the tone of the marble uniform and deprived it of none of its natural beauty; it easily assimilated those plain portions of the architecture with the naked figures, whose flesh-colored tone was probably produced by a thin coating, so as not to be prejudicial to delicacy in the representation of the forms, while material objects like draperies, etc., were painted encaustically as described and still to be seen".

Moreover, the exposed surfaces of marble ashlars are never spotlessly white; it is often streaked with bluish or yellowish stripes, which become still more prominent in time and already produce in the vicinity a play of color on the surfaces. If these are rubbed smooth or polished, the colors laid on the latter and the gilding are so reflected, and the original w "white" appears so strongly, that it is scarcely accepted as such by the eye (Compare in this respect Von Hansen's Academy in Athens).

128. The Painted Doric Temple.

If we place before our eyes an image of the painted Doric temple in accordance with the preceding, and based on what we have ourselves seen on authentic remains, the cella walls, columns, architraves and cornices then first shine with that beautiful clear orange-yellow tone, comparable to the color of the evening sky on the southern horizon at sunset, while the abacuses were decorated by a colored band (fret), the echinuses might have a band of anthemions, of scale patterns, or of leaves (while the projection and scale are not too large), and t the annulets gleamed with red coloring.

Continuous scroll ornaments decorated the front surfaces of the architraves, or the rich movable ornamentation of the golden shields and golden inscriptions covered them, while we may conceive the under surfaces as being decorated by painted interlacings. Gilded drops hung from the narrow regulas beneath the triglyphs, which were themselves ornamented by small green palm-leaves turned downward. The crowning head-bands were covered

covered by a delicately lined fret in red and green; the trig-
185 lyphs had the full azure blue tone and shone afar. The figures on the interposed metopes had the natural colors on the naked parts and on the draperies; the ground from which they rose was a full brownish-red, harmonizing with the blue of the triglyphs.

The head-bands of both may have been decorated by upright anthemion ornaments or by an interlacing without marked direction; The beaded astragals above gleamed with gold. The vertical band above the triglyph-frieze, produced by undercutting the cornice-slab, was decorated by a blue and yellow or golden fret pattern on a red ground. the mutules were covered by the same blue as the triglyphs and had golden or red drops. The entervening spaces and the undercut geison were vermilion red, the first being still more richly decorated by golden palm-ornaments. The ogee moulding above the geison had margined and recurved leaves colored green and red, and which also extended along the pediment beneath the cornice-slab. The statues of the pediment had their natural colors; their accessories and weapons gleamed in gold, and like the reliefs of the metopes, rose from a browinsh-red ground. Golden anthemions adorned the cymatiums, with a fret or sea-wave on the band beneath them, with recurved heart-leaves on the small echinus moulding, margined and having midribs on a green ground.[156]

Note 156. Compare the colored restoration of the pediment of the Parthenon in Durm's Constructive und Polychrome Details der Griechischen Baukunst. Pls. 9, 10, 12. Berlin. 1880.

The lions' heads of the cymatium, the acroteria ornaments and the antefixas, again shone in full colors or were entirely gilded, the covering and ridge tiles being decorated by colored l leaves and anthemions.

The ceilings of the porticos had the same color as a ground tone as the walls; the borders of the coffers were separated by golden beaded astragals on a deep blue or green ground, the horizontal surfaces were covered by red fret patterns, the echinus mouldings forming the transition to the ground of the coffers were decorated by recurved colored leaves, eggs-and-darts or heart-leaves, the ground itself with golden stars on a blue ground.

The supporting beams were covered on their under surfaces by painted interlacings, the echinus mouldings at their sides having recurved colored leaves. The cornice which crowned the cella wall and also extended above the frieze was decorated above with recurved colored leaves, with a golden fret on its band and colored heart-leaves on the moulding beneath.

The figures on the frieze of the cella rose in their natural colors from a brownish-red, blue, or white background, as on the metopes and the tympanum.

If we cast a glance towards the pronaos, we find the columns treated like the external ones, the capitals of the antae being likewise ornamented by recurved colored leaves and golden annulets on a green ground.

The space between the columns of the pronaos was filled by gilded bronze grilles (wooden lattices are reported in Epidauros)[157], which extended high up, and behind which gleamed vessels, goblets, cups, silver lamps, etc. But sculptured ornamentation was also not wanting here; the walls of the vestibule in the Sanctuary of Athene at Platea were decorated by two
126 pictures painted by Polygnotos; in that at Delphi were inscribed maxims for the practical uses of human life, such as "Learn to know thyself", "In nothing, too much", etc. Pedestrian statues of bronze were in the vestibule of a Temple in Corinth, marble statues of Athene and of Hermes before the entrance of the Temple of Apollo at Thebes; at the entrance into the Parthenon was placed the Statue of Iphicrates; statues stood around the Temple in Hermione; the certainly Corinthian Temple of Zeus Olympios had the same ornamentation before its columns. In the centre of the rear wall of the pronaos rose the colossal perforated folding doors of the principal entrance, made of gilded bronze, or of wood inlaid with ivory[158], thus forming the last decoration of the pronaos and that first seen on entering the sacred cella.[159]

Note 157. See Baunack. p. 81.

Note 158. See Baunack. p. 79.

Note 159. To the idea of a completely executed polychromy was formerly opposed that of Kugler(Denkm.d.Kunst. B. Pl.4.A. Stuttgardt. 1851), a partial one with white walls, shafts of

columns and architraves. The first seemed too chalky to some; the yellow transparent tone of crayon work was recalled by the other. The natural material looks as white and uninteresting as paper, and the "Raphe" on the marble does not actually appear as yellow as the painted local tone, and in both is the primary law expressed, that the architectural members mentioned must have the greatest clearness on the building, it being immaterial whether they are made somewhat colder or warmer in coloring. The statements concerning the use of color on the smaller architectural members and ornaments are otherwise approximately the same on both sides; blue triglyphs and the metopes with red grounds from Selinus, blue mutules with golden drops and red bands.

The signification of the metope in stone construction as masonry between two holes for ends of beams has given occasion to assume the ground of the metope in the same tone as the wall of the cella. If it was adorned by figures and the latter were painted, and the blue of the triglyphs was light and delicately harmonized, yet little of this can be restored, since scarcely anything of the ground yet remains, and the colors of the figures were already effective by contrast with the blue of the triglyphs. The colored reliefs on the so-called Alexander Sarcophagus (Macedonian royal sarcophagus) rise from a light marble ground and are very effective, as well as effective in the entire harmony of colors. Here and there will the colored figure frieze on a light ground be again held together by the strong color tones on the cymas above and beneath.

The picture will always be less favorable in the way of color, when the metopes exhibit no ornamentation by figures, and it may sink to tastelessness then. ItIf the triglyphs were then painted a very dark blue, as given by Fenger (Dorische Polychromie, etc. Berlin. 1886) and a similarly colored tympanum were placed above them, with a white local tone of the architecture in general, then Kugler's scheme becomes the full-sounding Renaissance decoration! As already stated, the decoration of the capitals by fret bands and foliage might well be retained for moderate dimensions of the capitals and steep forms of the echinus, or for greater projection thereof with anthemions (compare

Paestum), in the presence of Athenian steles, but this has not yet been shown by any remaining Doric stone capital, and therefore in all colored restorations, the foliage decoration must be taken as a possibility and not as a certainty, just like the red and blue "passevoilirte" annulets (See Fenger, Pls. 1, 2). Annulets painted entirely red are assumed, but neither on the Parthenon nor on the Temple on Egina.

Whatever may be indicated as probable for the ground of the figures of the metopes may also be assumed for the tympanum, since this is just as much inserted masonry as the ground of the metopes. Light metopes and light tympanum also produce harmony, but never light metopes with a tympanum wall painted blue or red. A colored ground for the figure friezes on the Parthenon and Theseion is not verified, but is probable, if the ground for the metopes was colored.

Further examples of colored architectural members are also found in Le Bas (Pl. 8; II-3, 4, 5, 6). Heydmann (Zeit.f.Bild. Kunst. 1887, p.285-6) justly remarks on Fenger's Polychromie:- "Such a polychromatic temple, --consider merely the interesting restoration of the Temple of Athena on Egina (Pl.1) or of the Parthenon,--- resembles a naked man, who has on a festal occasion placed a complete garland of bright flowers on his head".

d. Internal Decoration.

124. Ornamentation in Interior.

As the surfaces, members and ornaments on the exterior of the temple shone with magnificent colored decoration, this must then be continued and enhanced in the interior of the House of the Deity. The internal columns, architraves and cornices were therefore decorated with similar colors and by ornaments of like character as the external; but the walls were covered by paintings, as Pausanias describes in the Temple of Theseus at Athens, for example. According to the same authority, "the end wall opposite the doorway in the Temple of Zeus at Olympia was painted blue", while the other walls were decorated by paintings by Panaenus.
187. The paintings on the rear wall of the Temple at Messene represented the kings of Messenia; in Pausanias' time, the paintings on the walls of the Sanctuary of Artemis at Cilantheia had disappeared in the lapse of time; but those in the Sanctuary of

Esculapius and in the certainly Ionic Erectheion were still visible. Although no vestiges of these wall-paintings are now preserved, we still possess the definite evidence referred to.

Chapels are already mentioned in Athens with gilded ceilings and decoration by alabaster and by paintings; the splendor of the ceilings with their inlays of gold and ivory, their overlays of mosaics or of bronze plates with cast ornaments, has already been mentioned.

125. Statues of Deities and Consecrated Gifts.

The ornamentation and splendor of the interior was completed and enhanced by the statues of the deities and the consecrated gifts. Bronze shields were suspended in the Temple of Artemis Eukles in Thebes, like shields and garlands in the Temple of Zeus at Olympia, and the Armor of Marpessa in Tegea.

The more delicate and richer gifts lay on tables; others were placed at the feet of the statue of the deity or between the columns. The Throne of King Arimnestus stood as a consecrated gift in the Temple of Zeus at Olympia; the bronze Horses of Kyniska and a bronze tripod were also placed there. Besides the ancient chryselephantine statues of Zeus, of Hera enthroned, of the Horae, and of the beautiful Hermes of Praxiteles, there s stood in the Heraion at Olympia a bronze Aphrodite, the Chest of Cypselos, of cedar wood with reliefs of gold and ivory, a bed ornamented with ivory, a discus, and a table for the garlands of victors. In Tegea were the fetters of the captive Lacedemonians, the teeth and the suspended "hairless and rotten" skin of the Calydonian Boar. From Hadrian's time dated a peacock made of gold and gleaming stones in the Heraion near Mycenae, where the Shield of Euphorbus and the Bed of Hera were likewise to be seen, and the four golden horses with ivory hoofs, and the two Tritons, half made of gold and half of ivory, in a Temple at Corinth.

Smaller sculptured images were even suspended from the ceiling, as in the Temple of Asklepios at Sicyon: the Stymphalian birds, made of wood or plaster (therefore also being painted, since Pausanias could not determine the material), hung from the ceiling of the Temple at Mantinea; an egg surrounded by bands (Leda's egg) was suspended from the ceiling in the Temple of Hilaira and

Phoebe at Sparta.

The temple with its consecrated art works thus appeared to be a museum, created by the piety of the people.

126. Internal Decoration.

Interesting information is given concerning the treatment of the interior of the temple by the "Delian inscriptions" made known and interpreted by Homolle[160]. They first concern the preservation of the temple vessels (repairs of vases and kettles, the soldering of an ear on a silver cup, beakers, bowls, etc.), the purchase of a table for the Hieropois, several keys for the temple doors, then the insignia of a herald, pottery pitchers or bowls for containing silver or gold, ropes, hooks, together with appliances for preparing the statues of
188 the gods for festivals, on which occasions the altars must be cleansed, the statues washed and touched up; old and new, wooden and stone statues must receive an external polish and coloring. They were first washed with a solution of saltpeter in water by a sponge, then rubbed with oil or wax mixed with a fragrant unguent (of roses) in order to perfume the material. For this "chosmesis" of the statue of Artemis was employed, for example:- 2 drachms for sponge, 4 obols for saltpeter, 3 obols for oil, 4 obols for rags and wax, and 5 drachms for perfume (together 11 drachms, 5 obols). Complete information concerning the internal arrangement of the temple will indeed hereafter be given by the further publication of the "Delian Inscriptions", which refer to the entire series of structures in which the temple treasure was arranged, and which state what was placed in the pronaos, what was in the cella, and what in the opisthodome, what stood on the floor, hung on the wall, was preserved in chests, repositories, or separate receptacles. By these registers shall we first obtain a complete idea of the internal appointments of a Grecian temple..

Note 160. Bull.de Corr. Hellen. 1890. p.468-511.

127. Vases of Consecrated Water.

The sacred furniture of the temple comprised the vases of purifying water placed in the pronaos (with which each visitor to the temple must be sprinkled, either by himself or by a priest, symbolizing that he now approached the altar of the

deity with a pure heart), and the small altars (Table of the Shewbread in the Jewish Temple) placed in the cella before the sacred image, intended for the bloodless offerings.

128. Altars.

The latter were mostly of stone (perhaps also of wood), circular, square, or octagonal in form, their sides decorated by ox-skulls, garlands of flowers, and sacrificial knives, as shown by finds at Athens and on Delos. Pausanias mentions a silver altar at Mycenae. Of the names used for altars, "hestia, eschara, bomos", the last is most common. In the earliest times, these were of the greatest simplicity, rudely coursed of stones or sods; in Theocrites (Id. 26, 3 et seq) women construct altars with brush and leaves, and according to Pausanias (IX, 3, 4), the Boeotians built a great altar of wood[161].

Note 161. Compare Handb.d.Klass.Alter. by J.v.Müller. Half Bd. 14; Die Griechischen Sakralheiligthümer und das Bühnenwesen der Griechen und Römer. By P. Stengel and G.Oemichen. Munich. 1890. p.10-28 (Kultstätten), p.68-106 (Kultushandlungen). Further, E. Guhl and W. Kroner. Das Leben der Griechen und Römer. p. 57, Fig.42. Berlin. 1876. (Stuart found an octagonal altar at Athens). Lastly, J. Stuart and N. Revett, Antiquities of Athens. Part 27, Pl. 10(drawing of a round altar) and Part 28, Pl. 1(the three sides of a polgonal altar decorated by ox heads).

129. Statue of the Deity.

The statue of the deity, as the noblest and most sacred ornament, stood in a special cell (as in the ancient Sicilian temples, or the golden statue of Apollo at Delphi), or isolated in a space inclosed by low screens before the rear wall of the middle aisle, its colossal dimensions frequently reaching to the ceiling, gleaming with gold and no longer proportioned to the members and dimensions of the surrounding architecture.[162] The statues of "associate" deities were placed around it in some temples, with the consecrated gifts beyond them.

Note 162. If according to Strabo, the statue of the deity at Olympia had been able to rise from its seat, this must have endangered the roof of the temple.

130. Statues.

Curtains usually concealed the costly statues of the deities, a woolen one of Assyrian weaving and dyed with Phoenician purple (which could be lowered to the floor) being before the chryselephantine statue of Zeus in Olympia. The treasures of 189 the State were also most safely deposited in the sacred place; The opisthodome of the Parthenon was employed as a place of deposit; neither was the repose of the dead disturbed there, -- Antipoinos's daughter was interred in the interior of the Artemesion at Thebes (although an exceptional case).

Although in ancient times the statues of the deities were frequently rude images of stone, wood, or metal, they became in the best period art works of the highest rank, Architecture and Sculpture contesting the prize in the temple. The chryselephantine statues of Phidias belong with the most magnificent sculptures. Standing on a high pedestal decorated by sculptures, the naked parts made of ivory, and the drapery of gold and extending to the feet, with the ivory Gorgon's head on her breast, the Nike in one hand and the spear in the other, with a shield at her feet and the Dragon (Erichthonius) beside the spear, Pallas Athene was represented in the Parthenon, the intrinsic value of the draperies being estimated at $625,000. The Zeus at Olympia sat on a throne gleaming with gold, marble, ebony, and ivory, decorated by painted and sculptured figures and deities, his head surrounded by a garland of olive leaves, it also being made of gold and ivory, like the Athenian Pallas; on his right hand stood the Nike, likewise chryselephantine; he held in his left the golden sceptre with an eagle on its point; the golden sandals gleamed, as well as the heavy golden drapery, painted or enamelled with blossoming lilies and small figures. But even simpler figures in less costly materials also represented the deities, although frequently singularly inharmonious with our modern tastes.

Wooden statues were chiefly made in the ancient period, especially of ebony (Temple of Apollo at Megara), cypress, cedar, pear-wood (Heraion near Mycenae), oak, yew, and guiacum-wood; only the statue of Hermes at Cyllene is stated to have been carved from thyom-wood (fir?). Ivory and wood were later used tog-

together, and the latter was decorated with gold and color, as shown by the Statue of Athene in Aegira, whose face, hands and feet were of ivory, the remainder being of painted and gilded wood.

Some statues were also entirely made of ivory, like the Statue of Aphrodite in Megara, for example; a combination of wood and marble was shown by the Pallas Chalinites at Corinth, whose[168] body was of wood, while the face, hands and feet were of marble.

Note 168. Lucian, in his "Zeus Tragoides", permits Hermes to say of the gods:- "Thou seest how they are from Hellas, indeed graceful, beautiful, and artistically shaped, but all are of marble or bronze; only the most precious are of ivory, scarcely to be obtained with much gold, for color and polish; these are also internally made of wood and conceal in them great hordes of mice duelling there".

Small figures of cedar wood inlaid with gold were mentioned in the Treasuries at Olympia, as well as a statue of Apollo in beech with gilded head, and a statue of gold and Parian marble in Mycenae. The statue of Zeus at Aegira was of Pentelican marble, and that of Pallas at Sparta was of bronze.

The chryselephantine work may extend back to about 580 B.C, and Dipoenos and Scyllis were the earliest artists in this branch. Many statues were also covered with temporary decorations. A statue in a Temple in Sicyon wore a white woolen under garment, over it being a mantle; one in Aegion was covered by a transparent veil. The statues at other places were also decorated by
190. garlands (in the Ino Sanctuary at Thalama) or by myrtle twigs; (Statue of Hermes in the Erectheion); the lower portion of the Statue in the Temple of Dionysios at Phigaleia was concealed by laurel and ivy leaves; so far as visible, it was painted w with a bright vermilion color. Similar decoration by color was shown by the entirely gilded Statues of Dionysios in Corinth, whose faces were painted red.

A few eccentric statues of deities recall oriental influences, such as the three-eyed (one eye on the forehead) wooden Zeus in Larissa, and the Statue in the Sanctuary of Eurynome at Phigaleia, which was a woman to the hips, then a fish. Entirely different and opposed to the clear Greek nature is the descript-

description of the Statue in the cave of Demeter near Bassae; the wooden image is seated on a rock, has the form of a woman with the head and hair of a horse, wears a black under garment reaching to the toes, and has a dolphin on one hand, a dove sitting on the other.

181. Altars of Burnt Offering.

The altars for burnt offerings stood outside the temples and were originally mostly of square form, simple and without ornament. Frequently merely consisting of an elevation of the ground, of the heaped-up ashes of the sacrificed animals, or constructed of wood and unburnt bricks, they developed in the Hellenic period into great and artistic structures of stone, whose most beautiful example was perhaps the famous marble Altar at Pergamon. The Altar of Zeus rose on the east of the Pelopeion and in the centre of the Altis, and Pausanias states that it consisted of the first step (prothysis) 125 ft. in perimeter; that of the terrace above this was 32 ft., and the total height of the altar amounted to 22 ft. The animals were slaughtered on the Prothysis, their thighs were then carried to the top of the altar and were there burned. Stone steps on each side led up to the prothysis, with steps of ashes from thence to the top of the altar.

The arrangement and magnitude of the Altar in Olympia does not accord with its location as assumed for all temples alike, before the pediment end and the principal entrance to the Temple; the sacrificer must likewise have been unable to look towards the statue of the deity over the altar in consequence of its height of 22 ft., because he did not look towards the west.

182. Altar in Pergamon.

For the Altar in Pergamon, the mass of the masonry was a rectangle 114.8 by 124.64 ft., and was composed of the terrace, its external sides being decorated by sculptures. These rose above a base of moderate height and extended around three sides of the substructure for a length of 426.4 ft. The fourth side was occupied by a great flight of steps, the frieze being extended along their ends.

On its top was the terrace with the altar as its central point, enclosed by an Ionic portico 10.66 ft. high and raised on three

steps. The portico opened outwards, the solid rear wall being toward the altar.[164]

Note 164. See Gentralblatt d.Bauwesen. 1888, p.107.

133. Altar of Hiero II in Syracuse.

The great Altar of Hiéro II in Syracuse[165] had the length of a stadium with corresponding height and width, according to Diodorus. Its ruins were discovered in 1839 and fix the length of the base with strongly projecting steps and mouldings at 650.75 ft., the breadth at 71.5 ft. on the north and 74.18 ft. on the south, with an existing height of 19.68 ft.

Note 165. See P. Lupus. Die Stadt in Alterthum. Authorized german edition of Cavallari-Holm's Typografia Archaeologica di Siracusa. Strasburg. 1887. p.42, 299.

191. These dimensions are somewhat inferior to those given by Diodorus. The ruinous condition of the colossal structure and of the small finds of few fragments of architecture and sculpture afford only very imperfect conclusions upon the nature of the structure. Fragments of a triglyph frieze were found, with those of a Doric cornice with lions' heads, of the capital of a pier, of a great eagle, and of caryatids.

134. Altar in Parion.

A larger altar still stands in Parion, measuring a stadium on each side.

Consecrated gifts, that could not be placed in the temple itself, were arranged within the sacred precinct surrounding the house of the deity. Here were placed statues beneath the open sky or under graceful canopies, the Heroa enclosed by stone walls and containing trees and statues, the little chapels built in the form of small temples, the treasuries, and the altars erected to different deities.

135. Treasuries.

The treasuries in the sacred precincts served to receive the consecrated gifts, which on account of their kind and nature could neither be placed in the temple nor in the open air. Those discovered in Olympia have the form of a small rectangular temple with a vestibule, which either opens as a distyle-in-antis or is treated as a prostyle structure, its style appearing to have always been the Doric.

Those most important architecturally are those of Sicyon, of Metapont, of Megara, and of Gelo. Everywhere on the architectural parts were found remains of color; cobalt blue triglyphs and mutules on the Treasury of Sicyon, on that of Megara being triglyphs and mutules of blue-black color, red bands, blue tympanum, terra cotta cymas and tiles, while these were of marble on the Treasury first mentioned.

The interesting edifice of Gelo consisted of a cella 43.2 ft. long and 35.59 ft. wide, before which was later built on the southern and longer side a Doric prostyle of 6 columns in front and 2 and 1/2 in depth. The columns were strongly diminished; the capitals had 4 incisions at the necking and the echinus had 4 annulets; the architrave was high in proportion to the triglyph frieze; regulas and mutules were without guttae. Here likewise belong the box-like terra cotta coverings, fastened to the geison with pegs.

136. Precincts of Temples.

The temple cannot be conceived as sufficiently rich and imposing with its surrounding sculptures and small sanctuaries. But the impression must have been enhanced in the highest degree when different temples and their accessories were crowded together on a relatively limited area, and where temple precincts were planned, as in Athens, Olympia, etc. In spite of their neglect and mutilation, the Athenian and the Olympian are still examples of noble effect, which we can again restore in fancy, rebuilding the ruins of the temples, animating the sanctuaries by statues and consecrated gifts, representing to ourselves the areas filled by the solemnly harmonizing multitude of the participants in the Pan-Athenian festival, under the splendor of a southern sky and before the background of a fascinatingly beautiful landscape.

The temple precinct in Olympia may have had a similar effect at the time of the great festival games (Fig. 132), since Pausanias commences the fifth book of his comprehensive notes on Elis with
192 the proposition:- "Greece presents to the eye and ear many cau-
193 ses of astonishment' but the highest interest is connected with the sacred rites at Eleusis and the festival at Olympia". If not all works of sculpture and architecture had the uniformly

high finish, magnificence and beauty of execution found at Athens, yet the arrangement, grouping and magnitude of the art works placed in the midst of the shade-dispensing plane-trees of the Altis, of the venerable olive tree, with the surrounding temples, treasuries, gateways and porticoes, and the structures of the Gymnasion, the Hippodrome, the Theatre, etc., must have been powerfully attractive. Sacrifices could be made to the different deities at more than 30 altars; the number of the statues of the deities, of portrait statues of victors, and of consecrated gifts arranged in rows, were numberless. Great and promonent among these may have been the Zeus statue of the Eleans, 27 ft. high, the Hercules 10 cubits high, the beautiful Nike of Paeonios of Mende, the Group of Horses with the Charioteers, the bronze Bulls, the bronze Chorus of Boys on the Wall of the Altis, the 12 bronze statues of Zeus in front of the terrace wall of the treasuries, and the bronze pillars with the inscribed treaties of peace. The Precinct of Epidauros illustrated in Fig. 133 may serve as an example of a smaller design. (Fig. 133).

e. Kinds of Temples.

137. Original Form of Temple.

Opinions concerning the original form of the temple are pretty strongly divergent. Some embrace the views developed by Semper, that a tent, a roof borne by separate supports, or a monumental canopy, first protected the statue of the deity, and that the developed cella was only constructed beneath this later,
194. -- placing the columnar structure as the original and leading idea. Others at first build for their deity a small and massive structure of stone, cover it with stone slabs or wooden beams, furnish it with doors and windows, then afterwards transform one wall into a colonnade, and later a second, afterwards placing a colonnade before one wall, then another before a second, finally surrounding the entire building with a single or partly double series of columns, it always becoming somewhat larger and richer, until it attains in the dipteral temple a maximum in columnar decoration. If the little antae-temples, the prostyle and amphiprostyle designs are the most ancient, this development would leave nothing further to be desired in

consistency and correctness.

But in accordance with Oriental traditions, the oldest temples exhibit the closed, 3-celled temple-structure with a peripteral colonnade arranged independently of the cella.

"It seems as if the Greeks considered the entire temple as an artificial protection for the sacred statue of the god. They beheld in the externally enclosing walls of the cella a "hedge" around the divine statue, a sekos, and gave to the space thus enclosed the name of "fold" (sekos). Like watchmen, the columns surround this (periastasi peri ton sakon) and are the principal supports of the protecting roof above".[167]

Note 167. See Baunack, p. 64.

138. Rectangular Temples.

The ancient peripteral temples were dedicated each to a single deity and exhibit narrow and elongated cellas divided into three or two rooms in depth, which are connected together by wide doorways, -- thus as previously stated, being divided into a vestibule, a sacred, and a most sacbed place. With but two rooms, the enclosed vestibule gives place to an open one; it becomes a pronaos or prodomos. Hence the rear apartment was later opened to become the opisthodomos or posticum. Only the larger central room of the original triple division remains an enclosed cella, having the open porticos before its two end w walls.

Two of these forms of plan, the naos with a pronaos, or the naos with a pronaos and an opisthodome, also occur in the little temples, as well as the very simple form of the cella enclosed by four walls.

The introduction of colonnades in the interior of the cella indeed occurred in order to render possible a greater width with a substantial covering thereof, and perhaps (not invariably), to obtain more space in an upper story for the exhibition of consecrated gifts, if the idea of thus producing a richer treatment of the interior in this manner was not the determining cause. To this 3-aisled inner apartment, which appears as the chief idea in all the later houses of the deity, apartments were further added, which did not serve for religious purposes, as for example at the Parthenon, where a special room was adde

to the cella for the reception of the treasure of the State. (Fig. 134).

139. Circular Temples.

Besides rectangular cellas, circular ones are also found, for which we possess the evidence of ancient writers and actual proof in various existing remains. Thus a circular building with statues of Zeus and of Aphrodite stood in the Agora at Sparta: the Tholos near the Buleuterion at Athens, in which the Prytanes offered sacrifices, had this form; the circular form is also claimed for a few temples in Platea and in Delphi. Pausanias mentions another circular structure, the Philippeum erected in the Altis of Olympia by Philip of Macedon after the battle of Cheronea, and whose former existence was proved by the German excavations, but which indeed was not a temple, th though it may be still regarded as analagous to an actual circular temple. Like the rectangular temple, the cella was surrounded by columns. Of the Tholos of Polykleitos in the Hieron of Asklepios near Epidauros, merely the foundation walls and fragments of the entablature and columns were found, and not much more of the Arsinoeion on Samothrace.

140. Monopteral Temples.

For the monopteral, a peculiar form of temple given by Vitruvius, which merely consisted of an open colonnade with the entabmature and roof resting thereon, the little circular temples of the Exedra of Herodes Atticus in Olympia affords an example, and the Choragic Monument of Lysicrates at Athens is another, though not entirely analagous, as well as the Temple of Augustus on the Acropolis in Athens and the Julii Monument near St. Remy.

141. Double Temples.

But in certain cases, the temple also had the purpose of serving as a place for the worship of two deities; a separate room was then required for each. The cella was accordingly divided, and the double temple originated, the "Naos diplous."

Its cella could then either be divided by a longitudinal wall in accordance with Egyptian models, it might be divided in depth by a transverse wall, or its height might be divided into two stories by a beam ceiling. The last was the case in the Temple

of the Armed Aphrodite in Sparta mentioned by Pausanias; "the Temple had an upper story, dedicated to Morpho". No example of a division lengthwise remain. A division in depth is claimed by the Temple at Mantinea, dedicated to Ares and Aphrodite; the entrance to the cella of Ares was at the eastern end and that to the cella of Aphrodite at the western. The division at Sicyon was similar, ekcept that a single doorway led to both cellas there; "in the front room was the Statue of Hypnos and in the rear one that of Apollo".

The finest and also the most complex ekample of a temple, which was dedicated to several deities, is the Erectheion standing on the Acropolis of Athens (Fig. 134).

142. Telesterias.

It has already been shown in Chapter 1 that the temples were not intended to receive great multitudes of men, or for holding great festal assemblies therein, -- they were the seats and dwellings of the deities; the greater festival solemnities occurred outside them.

An exception is made in the buildings intended for the celebration of the mysteries, the consecrated temples (Telesteria or Megara), in which a large multitude of men were found engaged in a common act.

We have definite knowledge only of the single one at Eleusis, which dates from the era of Pericles; the cella forms a square apartment with a side 177.12 ft. long, which was divided into 8 aisles by 7 rows of columns; a series of steps extended along the walls of the cella in the outer aisle, interrupted in 6 places by passages.[168] An external portico of 12 columns was placed on one side of the cella.

Note 168. See ground plan in Praktika tes archaiol. etairais. Athens, 1888, as uell as Plate 1, Bericht von Dörpfeld. Fig. 134.

We should be compelled to abandon the previous basis of tradi-
197. tion and of fact in our considerations and trust to imagination, if we would finally busy ourselves with the critical examination of the various suggested "primitive forms of temples". It is indeed not impossible that between the heroic period and about 600 B.C., a special kind of temple may have existed, clearly worked out esthetically, and that those known to us (which we are other-

wise accustomed to consider as an image of perfection), are merely imperfect or misunderstood imitations of these; for not everything in them will fit certain established systems and theories. Neither shall we disparage the merit of such theoretical considerations, but must esteem them as hypotheses, and to advocate or controvert them being outside of our problem.

f. Lighting of Temple Cella.

148. General.

We see the interiors of Egyptian and Asian temples richly ornamented by colored decorations, sculptured ornament and costly furniture, without meeting with special arrangements for closely observing all these splendors by sunlight. The rooms, especially that one regarded as most sacred and most important, were withdrawn from all daylight.

Artificial lighting was better suited to the spirit of a religious faith, in which so much was based on magnificence and pageantry. The exclusion or the softening of the daylight in the interiors of religious buildings has been retained in the entire South until the present day, and it has been transferred to the modern Christian-Catholic and Jewish Houses of God. No visitor can suppress a certain spell in these dimly or artificially lighted interiors, which affects his spirit; a feeling of consecration, of community, and of reflection is aroused and maintained by entering therein.

Grecian architects and priests also had a similar aim, when they suppressed the placing of windows in the cella and only admitted light through the great doorways, which, as already stated, furnished a more scanty lighting. In spite of all this, it is not sufficient for the modern or Northern man; his antique deity requires more light! Since no windows in Doric temple cellas are preserved, and the primitive temple with metope windows can scarcely thought to have existed actually, a skylight must then light the house of the deity, like a modern museum hall, which men chiefly visit for the purpose of critical and artistic studies for their instruction, but not to produce in themselves a thoughtful frame of mind. The evidence of Vitruvius is also appealed to, who calmly states that no temple in Rome had a skylight, but prefers to learn from tradition

that such existed at Athens. No other writer in antiquity alludes to such a peculiar arrangement; by the statements of all others, the contrary custom must be accepted. Every single passage of classical literature bearing directly on this arrangement has always had to suffer serious attacks of investigators.

144. Hypaethral Temples.

Temples with such openings in the roof and ceiling are termed "hypaethral". The passage of Vitruvius relating thereto says: (III,I,8): "Yet the hypaethral temple is decastyle, both in the vestibule and in the posticum. It is otherwise entirely similar
198 to the dipteral temple; but has columns above columns in the interior standing free from the walls, so that one may pass around, as in the aisles of the court with porticos; but the central portion is under the open sky and without a roof; on each side is an entrance into the vestibule and the rear apartment with folding doors. An example thereof is not found in Rome, but in the octastyle Olympeion at Athens". ----(I,II,5). "
"Structures are to be built under the open sky and open overhead, dedicated to Jupiter with his lightning, to Heaven, to the Sun-god and the Moon-goddess, whose forms and acts we now behold in open and clear space".

A few passages in Plutarch, Ovid, and Varro, are evidently tortured by various interpreters, or they are torn from their[169] context, in order to be used for one or another opinion. Statements of Pausanias, that he saw various temples without roofs, for which condition he usually assigns an unfinished or ruinous state, have no importance here.

Note 169. The opposed views culminate in two treatises:- Ross, L. Hellenika. Heft. 1. No more Hypaethral Temple! Halle, 1846. Bötticher, K. Der Hypaethral Temple proved against Prof-Dr. Ross by the evidence of Vithuvius. Potsdam, 1847.

Some declare that Bötticher has incontestably established the hypaethral temple; others esteem his treatise to be merely a weak attempt to oppose Ross' views.

Hence Vitruvius' entirely uncovered central aisle will suit the smallest number; to know that the chryselephantine statue and the treasures of the temple, were exposed to the heat of the sun and the rain of winter, must then be considered. Hence,

but a part is taken instead of the whole, and at a proper distance from the statue of the deity, a small skylight is constructed, which can be readily closed when required. Others close the opening with brightly colored tapestry, such as the Romans used in theatres and amphitheatres. Quatremere de Quincy vaults the ceiling of the temple and furnishes it (with openings for light and ventilation, etc. (Dormer windows). Cockerell even makes the little temples on Egina and at Phigaleia hypaethral, and in his restoration of the Temple at Phigaleia, he covers the middle aisle with a segmental tunnel vault, which is furnished with a skylight like that in the Bracchio Nuovo. But Chipiez presented a prettier solution in past years and one not made without artistic taste, but which does not al all correspond to the requirements of Vitruvius, since both side aisles are lighted, and the ceiling of the middle aisle is closed. (See Fig. 33.[170])

Note 170. For the different hypaethral arrangements proposed, see the next volume of this Handbuch (Roman), Figs. 288 to 291, Arts. 319 to 321, pages 313 to 318.

Since the evidence of Vitruvius, which is moreover not free from contradictions, rests on too insecure a basis, or is only acceptable if we regard the main aisle as an uncovered court before a shrine in which the statue of the deity was placed for protection, as appears to have been the case in the great temples at Selinus or at Miletus; since moreover we possess no other accounts, and the existing restorations by descriptions and drawings are inadmissible, and all beginning points relating thereto are wanting on the monuments, -- we will therefore believe that what was customary at Rome was likewise usual in Greece. Not a single one of the numerous representations of ancient temples on slabs of marble and on coins exhibits an opening in the roof. It is also not to be assumed that esthetic considerations were entirely neglected, that the interior of a house of the deity with its costly treasures and sculptures
199 was "exposed to the snow and rainfall from the open sky, as well as to owls and bats". Neither has any arrangement of the pavement of any temple been found, corresponding to an opening in the roof, for carrying off the water that would enter there;

no impluvium and no drains for water are yet known, and it is probable that none will ever be. Nothing authorizes the assumption that the Parthenon at Athens, the Temple of Poseidon at Paestum, the Temple of Athene on Egina, etc., were hypaethral, and there is no evidence for this. When the Christians transformed the Parthenon into a church, they indeed found the lighting through the eastern doorway sufficient; according to the evidence of Wheler and Spon (1676), they added no new openings for light, "they permitted the light to enter from the east, and this is still the entire lighting. -- The Temple was externally covered with large slabs of stone, some of which have fallen and are to be seen in the mosque". Other authorities contradict this.[171]

Note 171. See Mitth. d. Kais. Deutsch. Arch. Inst. Abth. Athen. Vol. II. p. 42.

The lighting may certainly not have been as abundant as in the native churches of the famous travelers, a circumstance that we Northeners, accustomed to well lighted interiors (and who desire to read in churches), also meet with in the Christian churches of Italy, (see San Miniato, Orvieto, etc, where instead of plates of glass, thin and transparent slabs of marble partially fill the openings for light, as well as almost all Early Christian churches); They likewise state in this sense; "From the vestibule, we entered the temple through a lofty doorway placed in the middle of the front end; yet neither my companion nor myself were so greatly astonished by the darkness prevailing therein, as was Mr. Guilliter, since our observations in other pagan temples had already accustomed us thereto". And yet those Christians considered it proper to decorate the walls of the but dimly lighted interior by paintings, although but half its lofty entrance doorway was probably used for the admission of light, the other half being closed by wooden folding doors (so that only one-half as much light could enter the interior as in ancient times), also to place in the choir a canopy (heaven) supported by 4 prophyry columns, and to ornament the ceiling over the altar in the choir by a representation of the Holy Virgin in mosaic work.

Even in the Renaissance period did men become as solicitous

in regard to the light in the decoration of ecclesiastical or secular interiors as now, and which, if too abundant, may easily make an interior common and valueless.

It is unnecessary in the South to admit heat and light rays of the sun into the interior of the building in masses, as in the North; precautions are taken to keep them out as much as possible, as proved in all its buildings from the earliest antiquity until the modern era.[172]

Note 172. Choisy expresses himself in this manner in Etudes Epig. sur l' Arch. Grecque; III Etude. L'Erectheium, etc. Paris. 1884. p. 152. "Under the luminous sky of Athens, the doorway sufficed in case of need to light the cella". --- Dieulafoy continues:-- "For more than a century, architects and archaeologists have continually proposed hypothetical restorations of the lighting of Greek temples, especially of the Parthenon. Solutions succeed each other, but not even the most ingenious are free from just criticism. One need not be surprised; I am convinced that the cella of the Parthenon received light only through the entrance doorway.

The furthest columns were scarcely visible and seemed to flee into the darkness, the dimensions of the hall were exaggerated in the dim light; the Statue of Minerva, made of precious metals and ivory, alone attracted the rays of light scattered through the air in the temple, and became animated by a mystic life by their reflections. Who knows whether, under the shining sky of Attica, the light passing through the doorway may not have already been too bright, and whether the Greeks did not modify it by a grille placed in the upper part of the opening.

Every visitor to the East and to Greece knows how difficult it is to produce comparative darkness in the daytime in those strongly lighted countries; a badly fitted door or a slight crack in the walls suffices to light the interiors of the largest rooms.

Moreover, without mentioning paintings, that are faded by too bright light, all exposed objects in the temple would gain by protection from light and dust.

The very conclusive example of the Apadana (Persepolis)

with 100 columns furnishes us with indisputable proof of the uselessness of windows in Grecian temples. The volume of the interior of the cella of the Parthenon was nearly 2,472,092 cubic feet; the room was lighted by an opening of 538.2 sq. feet, which gives .007 as the ratio of the opening to the volume."

Pausanias (V,20) says in a well known passage relating to the soldier found between the roof and ceiling of the Heraion: "After his death there, neither the heat of summer nor the frost of winter could injure the corpse, since it was protected on all sides". This would not have been the case under the hypaethral arrangement.

Architects and archaeologists, who are still attached to the theory of the hypaethral temple, must take these into account.

200. g. Periods of the Style and their Monuments.

145. Periods.

Semper distinguishes six principal periods in the history of the Doric style, which are chronologically arranged and include:-

a. The Protodoric.
b. The earliest lax Archaic. (7 th century B.C).
c. The second severe Archaic Doric. (6 th century, Era of the Tyrants).
d. The third developed Doric. (5 th century.)
e. The Attic Doric. (5 th century, Era of Pericles).
f. The late Doric. (4 th century and later, Period of Alexander to Hadrian).

This subdivision has already been adopted in numerous places and will be followed here, except that instead of "Protodoric", we will use Early Doric, although it cannot be denied that with this, one may frequently fall into insoluble historical contradictions of many kinds.

1). The Early Doric Style.

146. Characteristics.

There can be no doubt that in the course of the 7 th century, from which the veil has not yet been completely lifted, columnar construction had already assumed an artistic form, that the echinus capital, this simplest transitional form for receiving the load, that the triply divided entablature had al-

already been fixed before the Doric period, and also that their ornaments had already been elaborated to a certain degree.

This style of architecture had indeed not then assumed a fixed form; definite rules of proportion were scarcely in use; foreign elements were still mingled with those, which later separated themselves as especially Doric; and it remained until the next period to perform the necessary sifting and refining by passing through transitional steps of many kinds.

Here are especially to be placed those monuments belonging to wooden architecture or to that of mixed wood and stone, in which, for example, the foundations, substructure and steps were of ashlars, the walls of the cella were of unburnt bricks, the antae were of wood or even of stone, the entablature (frieze, architrave and cornice) were still entirely constructed of wood, retaining characteristic ornamentation, later transferred to stone construction; the roof was treated as a segmental arched terrace-roof of clay and straw, or was even a roof with rafters.

The imported idea of the Egyptian stone column influenced the form of the column; the characteristic form of the capital was decided by the corresponding attempts at the Lions' Gate and the Treasury of Atreus at Mycenae, and on Cypriote buildings. Motives for the oldest forms of capitals are further given by the vase paintings, which frequently exhibit the architecture of an earlier time, than that of the ceramic objects on which these are represented, as well as the stele caps found in the so-called Persian ruins on the Acropolis of Athens.

No assured beginning points for the art forms of these buildings now remain; we can only conjecture them from the works of the later architecture in stone. We must assume that the regulas and drops of the architrave, that the triglyph-frieze and the cornice with its mutules and dropsearlier had a definite purpose, or resulted from a structural form.

147. Monuments.

Only the following monuments are therefore to be considered here: the Fountain-Sanctuary in Cadacchio, the Temple in Assos, with its very archaic sculptures on the architrave and on the metopes, with the absence of any characteristic decorative members, and the Heraion in Olympia.

1. The ancient Fountain-Sanctuary at Cadacchio on Corfu is preserved for us in abundant fragments (at the discovery of which were found bricks with ancient inscriptions, scarabei, etc.), with 6 columns in front and originally 12 along the sides. A portion of the cella walls, now scarcely 3.28 ft. high, and shafts of 13 columns were found. The columns are proportionally slender, are surrounded by 20 extremely shallow flutes, are moderately diminished with straight sides, and have intervals wide in proportion to the diameters, while the distance from centre of columns is only 7.48 ft., and but 6.89 ft. next the angle column.

The entablature exhibits foreign members; the frieze is without triglyphs and the pediment is high; the decoration of the different architectural members is in relief. A single capital has a circle of leaves at its junction with the shaft and a strongly swelled echinus. The entire façade in outline gives an impression of breadth and heaviness.[173]

Note 173. See Cockerell, Kinnard, Donaldson, Jenkins, and Railton. Antiq. of Athens. German edit. Lief. III, pls. 4-8. Leipzig and Darmstadt. (Eng. Edit. in Arch. Library).

2. The Temple in Assos on the Aeolic coast possesses a pronounced archaic character, and according to the statements of Texier, it has an increased arrangement of steps on the façade and 6 × 13 columns: these are 7.17 and 7.97 ft. between centres, are 15.42 ft. high, and are surrounded by 16 flutes. The capital is like that at Cadaccnio. The architrave is decorated by a continuous series of figures, whose character indicates a high antiquity and exhibits in treatment an alliance with the sculptures of Etruscan tombs.(Corneto). The regulas are without drops, the triglyphs are low, the metopes are ornamented by similar archaic figure reliefs, like those on the architrave; the mutules of the cornice are likewise without drops; holes in the cornice are filled with cast lead and indicate a cyma of metal or of terra cotta. The material used consists of a volcanic stone, trachyte, of a dark color, which was indeed coated with stucco. The American excavations in Assos in 1881 substantiate the statements of Texier, particularly in regard to the number of columns, and approximately so, as to their

height (15.42 instead of 15.68 ft.); but the existence of an entasis is denied. It is proved that the columns of the pronaos had 18 flutes, and those of the portico 16. Moreover, no column was then found in its place, nor were the ashlars of the cella; even the upper steps on the east and west sides are wanting.

In opposition to Texier's plan, the temple is now represented as a plain antae-temple with a peripteral colonnade (allied to the middle city Temple in Selinus), and measuring on the upper step 46.02 ft. wide and 99.48 ft. long. The blocks of the lower step still retain the setting bosses, the cornice blocks have U-shaped grooves for the hoisting rope, as well as iron cramp bonds; the drums of the columns and the abutting surfaces of the ashlars have closely dressed edges. Both the plain and the sculptured metopes were slipped into grooves in the triglyphs. The roof tiles were burnt terra cotta. The recently
202 discovered sculptures of the architrave are now deposited in the Museum at Constantinople. The early date formerly assigned to the temple (7 th century B.C.) is now reduced by Clarke and it is referred to 479 B.C., an assumption in which I can by no means concur.[174]

Note 174. See Clarke, J. T. Report on the Investigations at Assos. 1881 et seq. Boston. 1882. P. 215, pl. 8. Also:- Adler, F. Die Ausgrabungen in Assos. Cent. d. Bauw. 1883. p.67.

3. The Heraion in Olympia lays claim to a high antiquity, was erected by the inhabitants of Scillus in about the eighth year of the rule of Oxylos over Elis, and it is indeed the oldest remaining house of a deity in Greece, though only preserved in a few ruins rising above the soil.

The original building was founded about 1000 B. C. and must have suffered various works of restoration in the course of time, as may be concluded from the wooden columns in the opisthodome, mentioned by Pausanias, and the finds during the discovery of the remains of the temple. The temple was peripteral, with 6 × 16 columns, which rose from a stylobate of two steps; the cella was divided by internal rows of columns (only the marks of the location of these being found), and it was furnished with pronaos and posticum-in-antis; its dimensions are

81.50 by 164.03 ft. The diameters of the columns differ not less than 11 3/8 inches (3.28 to 4.23 ft.), the capitals exhibit all possible kinds of cymas; the shafts of the columns have 20 flutes, though a single one makes an exception with 16. The intervals between the axes exhibit strong differences, their average value being taken at 10.73 ft. The columns of unequal diameters stand on three sides tangent to the upper step, while on the fourth or north side, their centres lie in a straight line. As seldom occurs, the cella columns lie on the same transverse axis with the portico columns. The antae consist of separate projecting wooden pieces.

The striking thickness of the walls is also to be mentioned, whose lower courses were of ashlars and the upper were of sun-dried bricks, as well as the small width of the middle aisle (12.47 ft.), which exceeds the external intercolumniations by only about 4 inches, thus not even attaining the width of a common living room. The architrave and frieze were not found and may indeed have been of wood.

Under the eastern portico is only a sill instead of a foundation; towards the west, the foundation walls increase in depth to 8.53 ft. and in width to 12.074 ft. The site of the building is on the northeast on sand as hard as stone, and is on soft river sand on the west and southwest. The western and southwestern portions of the temple have settled considerably, a circumstance which must indeed be ascribed to the varied character of the site and the varying depths of the foundations.

The building material consists of a yellow limestone; a few columns were of a coarse shell-conglomerate; the stone masonry was covered with stucco, and the roof was covered with terra cotta tiles. The external appearance of the ruins recalls those of Sicilian temples.

2). Lax Archaic Style.

148. Characteristics.

The first epoch of the style of the historic period exhibits in its works a high crepidoma with a flight of steps in front, and a certain endeavor after colossalness in the building makes itself felt. The temple is divided in its depth into three distinct a partments, the pronaos of nearly square plan, the elonga-

elongated cella, and the short opisthodome apartment with its somewhat raised floor, which received the statue of the deity.

The columns are strongly diminished, have an entasis, and are generally covered by 20 flutes; a single incision at the neck is customary, though the triple incision is already known. The capital is low, but projects strongly; a deep hollow at the necking forms the transition to the shaft of the column from it; the plinth (abacus ?) is of massive form.

The front surface of the architrave lies in a vertical plane tangent to the upper circumference of the column; the architrave is higher than the frieze, and the entablature is on the whole heavy. The triglyphs are broad and low, the upper ends of the grooves are sometimes curved (pointed or ogee), sometimes treated with a weak or softened outline like a volute. The metopes have a head band and ornaments in relief, the latter often en-
203. tirely or in part of marble. The geison is massive; the mutules over the metopes are only half as large as those over the triglyphs, and but 9 drops are suspended from them.

The cyma is generally high, frequently being merely a vertical band of terra cotta decorated by lions' heads. The pediment is still high; the ceiling of the portico commences at the upper edge of the frieze; the triglyphs are repeated across the end walls of the cella.

In the polychromatic coloring, besides the full colors of blue, yellow and red, there also occur green, black, and white, with yellowish and brownish to blackish tones on the terra cotta (tiles, antaefixes and cymas).

149. Monuments.

1. The Temple (D of Hittorf) in Selinus (Selinus founded in 628 from Megara Hyblea and forever destroyed by Hannibal Gisgon in 409) is a peripteral temple with 6 × 13 columns, those of the portico being strongly diminished and having 20 flutes, while those of the pronaos are smaller and have 16. The cella is divided into three parts, and it is without antae, but on the contrary, it has three-quarter columns attached to the projecting side walls of the pronaos; the opisthodome is very deep. The capital is low and projects strongly, has a deep hollow, 4 annulets and a single incision at the necking. The architrave is a little

higher than the frieze; the middle blocks are 14.697 ft. long, the triglyphs are heavy and the metopes are narrow and without sculptures. The frieze of the cella is lower than that on the exterior. The drops on the regulas of the architrave hang free; half mutules only are above the metopes on the heavy and but slightly projecting geison. The triglyph-frieze also extends along the end walls of the cella. The temple stands on this side of Selinus on a plateau elevated 154.19 ft. above the level of the sea; its materials were obtained from the limestone quarry in the vicinity.

2. The second oldest Temple (C of Hittorf) in Selinus is a peripteral building with 6 × 17 columns, and with another row of columns interposed before the pronaos, and it stands on a substructure of 4 steps, which is changed into a flight of 9 steps at the entrance facade. The cella is without antae and is divided into three parts, a pronaos of small depth, an elongated central apartment, and a short opisthodome. The columns are not all of equal diameter (6.381 to 5.810 ft.) and are not equally spaced; the larger ones are set on the ends. The shafts of the columns are monolithic and have 16 flutes; the capital projects strongly, is decorated by a hollow of no great depth, with 4 annulets and 3 incisions at the necking.

The upper member of the architrave is peculiar, being a round between two leaf-mouldings, with regulas from which drops hang free. The frieze is lower than the architrave, whose largest blocks measure 14.908 ft. in length; the triglyphs are broad, their grooves ending in ogee arches, the fillets have borders and their surfaces are curved forward at top, the surfaces of the metopes are deeply recessed within borders and are decorated by high reliefs in marble. The cornice is stumpy and massive; half mutule blocks only are above the metopes, their drops treated as tolerably long cylindrical pegs.

The limestone was covered with stucco; the remains of color still exist on the ruins in many places. Here likewise belong the painted terra cottas and rain spouts. The building was overthrown by an earthquake.

3. The Temple of the Lycian Apollo, called Chiesa di Sansone, at Metapontum. A hexastyle peripteral building located on a lev-

level plain, it has been entirely uncovered during recent years. The foundations were constructed of tufa blocks (measuring 2.10 × 3.03 × 1.28 ft.) without mortar, carefully bedded in the soil. The stereobate must have consisted of 5 courses, as deduced from a still existing fragment of wall. No vestige of the steps or of the floor yet remains. The temple measured 135.87 × 73.8 ft. and 127.92 ×,65.6 ft. on the upper step of the stylobate; on this 6 columns stood at each end and 12 on each side, which had a height of 18.37 ft. with a lower diameter of 4.46 ft. Besides 40 shafts of columns, 18 capitals were found, which measure 636 ft. across the abacus and have a diameter of 3.44 ft. at the necking member. Two rectangular bands border the echinus, from which a deeply undercut hollow extends to the shaft, which was decorated by 20 flutes.

Two fragments of the entablature were found, which are accepted as remains of triglyphs and are represented in Fig. 89, p. 117. Besides the remains of two lions' heads of Parian marble, which formerly ornamented the gutters of the roof, many terra cottas were found, such as antefixas, egg-and-dart mouldings, and lions' heads,-- six different kinds of the latter! To this temple likewise belonged the colored terra cotta boxes shown in Fig. 98 (p. 180). Lacava[175] remarks on this:-- "e nel quale si trova un chiodo di bronzo assai ben conservato, della lunghezza di centimetri 14, che dimostra il modo con cui le terrecotte si sospendevano all cornice del tempio." A dedicatory inscription was found on the temple in the following words:- "Apollonos Lych.eimi, Theageos Rod tn(ema). The temple was probably thrown down in ruins by an earthquake.

Note 175. Topog. e Storia di Metaponto. Naples. 1891. p. 115, pls. V, VI. -- For foundations, see same work, pl. II; for the form of the capital, pl. III and pp. 70 - 81; also Sante Simone. Studi sugli avanzi di Metaponto. Bari. 1875.

4. The Tavola dei Palladini or the Tempio delle Colonne Palladini in Metapontum. A peripteral structure of 6 × 20 columns standing in the vicinity of the preceding building, of which 10 + 5 = 15 columns with the corresponding architrave are preserved. The cella was composed of two rooms of unequal size, the front one measuring 37.0 × 20.66 ft. and the rear one being

12.78 × 20.66 ft. The columns were constructed with 4, 5, 6 or 7 drums, had a lower diameter of 3.61 ft. and stood 9.51 -- 9.54 -- 9.64 ft. between centres. The strongly diminished shafts were decorated by 20 flutes, and on their external surfaces were many remains of the ancient stucco coating. Two drawings of the have been published, one by the Duc de Luynes (1828), the other by Sante Simone (1875), but they do not agree,[176] and indeed neither is sufficiently accurate. Since the capitals were also coated with stucco, the form cut on the stone gives merely approximate information concerning the completed form of the capital.

Note 176. See Lacava. Pls. IX and X.

The northeast angle of the stylobate was fiund and it is composed of 6 courses, constructed of porous limestone ashlars, averaging 1.31 × 3.61 × 2.46 ft. At this temple were likewise found painted terra cottas, lions' heads, water-spouts, etc., similar to those of the Temple of the Lycian Apollo; hence both were coated with stucco, painted and ornamented with colored terra cottas.

5. The Temple of Demeter at Paestum (Posidonia, founded from Sybaris in 700 B. C., or in 600 B. C., according to other accounts, came under Roman rule in 273, and it was already under Augustus brought into bad repute and depopulated by the unhealthy air) is a peripteral structure of 6 × 13 columns on a substructure of 3 steps, which does not extend entirely around the building. The cella is divided into three parts in accordance with ancient custom, and it has its pronaos in the form of a tetraprostyle and 4 columns in depth, whose floor is raised in front by one step and in the middle by two other and wider ones, its columns have bases, to which correspond short portions of the cella walls with antae. A separate shrine for the statue of the deity was constructed against the rear wall of the cella; a doorway leads from the opisthodome to the portico. The columns stand vertically, are strongly curved in outline, sacklike, with 24 flutes on their external surfaces. The echinus projects strongly, is decorated next the shaft by a small round instead of by annulets; the hollow has recurved leaves; the flutes end at top in curved form. The architrave, whose front surface coincides with a tangent to the upper circumference of

of the column, is almost of the same height as the frieze; the taenia and the regulas and drops are replaced by a specially designed cornice member, on which vestiges of leaves mav still be recognized. The frieze consists of long slabs in which grooves are cut to receive the triglyphs; the latter are now wanting, having indeed fallen off, since the necessary support was withdrawn from them by the fall of the upper portions of the cornice. The triglyphs were narrow, the metopes without relief ornament, but with a head band (whose existence is by some denied in an incomprehensible way); in height, the cornice consists of two massive slabs, one above the other, and whose original form can no longer be recognized. After a comparison on the spot, I have no ground for accepting the existing publications as especially reliable, and must therefore disclaim any representation of the detail forms, which are no longer to be made out, as well as the assumption that half metopes were placed at the angles, which can no longer be determined, and whose former existence I may doubt. The sack-like, strongly curved columns with their greatly projecting decorated capitals, the heavy entablature (which goes into the height of the columns 2 1/2 times), the high pediment, the heavy and even unrefined detail forms, permeated by foreign elements, the possible projection of the triglyphs in front of the surface of the architrave, which recalls the ancient rock-cut monuments of Lycia, permit the structure to appear as very ancient. (See Fig. 90, p. 118 and Fig. 135).

Reddish yellow tufaceous limestone, quarried in the vicinity, was employed for the building.

6. The so-called Basilica in Paestum, unique of its kind in plan, is a peripteral structure of 9 × 18 columns and exhibits forms allied to those of the Temple of Demeter; strongly diminished antae with peculiar strongly curved capitals form the ends of the side walls of the cella, whose adjacent parts still remain; the sack-like columns, which are here still more strongly diminished, the strongly projecting capital with a small round instead of the annulets, the hollow decorated by leaves, 225 are also found here as well as there. In like manner, a crown-

crowning member lies above the architrave, cut as a separate course, its form no longer to be determined, and above it are some plain portions of the frieze.

A row of columns extends along the middle of the wide cella, "perhaps to support the roof,,instead of the two rows of other temples", according to Semper.

Pausanias says of the Korkyrean Hall in Elis, that it was divided along in the middle by a wall, which supported the ridge; the columns placed along the central axis at Paestum may therefore have had the same purpose.

7. The Capital of the Memorial Column od Xenvares, the Capital in the Anakten House in Tyrins, and Fragments of architectural members in the Persian Ruins at Athens.

3). Severe Archaic Doric Style.

150. Characteristics.

In the severe archaic style, the cella of the temple was retained in accordance with the ancient custom; on the other hand, the columns becom straight and more slender with greater diminution, while the capitals again exhibit the flat and widely projecting echinus with a hollow below the annulets, in w which the edges of the flutes of the shaft terminate. The architrave still generally remains higher than the frieze, and the triglyphs become narrower, the geison has similar mutules with 18 drops above them as well as over the metopes. The pediment loses something in height; the porous or coarse limestone is still always retained as a building material. but it is covered bw stucco and painting. The colossal Ionic-Asiatic architectural undertakings of this period also aroused the Doric races to similar works, thus explaining phenominal structures, such as the gigantic Temple of Zeus at Selinus and the heavy Temple of Artemis at Syracuse.

151. Monuments.

1. The Temple ?S of Hittorf) in Selinus, placed on the plateau above the river, on a substructure of 4 steps, being a peripteral structure of 6 × 14 columns with an interposed colonnade in front, which is placed sc near the cella wall, that the outwardly opening leaves of the doors scarcely had the space requisite for opening. The cella is divided into three parts,

with a disproportionately long central apartment (almost 1 to 4, the ancient Heraion at Olympia being 1 to 3.5, or 1 to 7 in the central aisle) and without antae. The columns are slender, strongly diminished, with 20 flutes, and have capitals with a strongly projecting echinus, 4 annulets and a weak hollow, in which the flutes terminate. The longest blocks of the architrave measure 15.157 ft.; the drops of the regulas hang free; the metopes are decorated by figures which exhibit Asiatic fashions of hair and beards and forms of features, as well as symmetrical garments with abundant folds; the entire entablature goes into the height
226 of the column 2 1/4 times. The columns of the inner colonnade have 16 flutes, which are separated from each other by fillets, like the Ionic. Vestiges of painting are preserved.

2. The great Temple of Zeus at Selinus was one of the largest in antiquity. Its length was greater than that of the mighty Temple of Zeus at Akragas, and it appears to have been only exceeded by that of the Temple of Artemis at Ephesus. A pseudodipteral structure rose on a substructure of 2 steps, having 8 × 17 columns, which had a strong diminution but no entasis, and were composed of great blocks and had 20 flutes. In the interior of the building were columns and capitals smaller than those found on the exterior; a subdivision of the cella into three aisles by two rows of columns, or a great uncovered court surrounded by columns, is therefore assumed. According to the vestiges of the masonry, the statue of the deity may have stood in a shrine at the rear of the cella or in the adjoining courtyard.

The temple was never completed; only two of the columns were entirely fluted; on others preparation is made for 20 shallow flutes; the remainder are still entirely plain. At the destruction of the city by the Carthaginians (409 B.C.), the temple was therefore not completed. The building material was furnished by the limestone quarry of the modern Campobello; drums of columns 7.874 ft. in diameter and 9.843 ft. high, intended for the temple and ready for transportation, still lie in the quarry; at that epoch, they must have been taken over an undulating country and then across the river Selinus to the city.

3. The Olympeion in Syracuse. Its site in the corn fields on the low hills still shows two monolithic Doric columns of tufa, whose surface is occupied by 16 flutes. The upper ends of

the shafts as well as the capitals are wanting, so that the ratio of diameter to height can no longer be accurately determined; yet it may be assumed at 1 to 4 1/4, the total height of the columns being about 26.24 ft.

Scarcely anything of the stylobate and steps is now preserved. It is of great interest, that painted terra cottas (now in the Museum at Syracuse) have recently been found near the columns, which bear the same character as those of Selinus, Olympia, and Athens, and which were indeed once used in like manner as in Metapontum, to decorate the roof cornice or to cover beams.

In the work named below,[177] the copper nails are not given, which were found later and accurately fit the holes in the terterra cottas, but the use of terra cotta cases beside each o other on wood and stone is assumed. The authors state in regard to the latter;[178] "we have put in place the fragment of terra cotta . . . which was applied as a facing for stone too coarse to be sculptured", . an explanation, that as an architect I can only adopt.

Note 177. Duc de Luynes & F. J. Debacq. Metaponte. Paris. 1833. Pl. X, Fig. 2.

Note 178. Page 49 of the same work.

The coarse shelly limestone is full of holes and permits ornamentation only on a stucco coating, or more permanently on a terra cotta covering. The material employed for the Treasury of Gelo in Olympia indeed led to similar methods, and the metal nails in the limestone cornice there showe the mode of fixing to the stone, while the copper nails of Metapontum represent that to wood. Both propositions of Duc de Luynes and Debacq have been finally shown by the excavations and finds to be acceptable and correct.

The high antiquity of the Olympeion was first proved by the fact, that the lists of citizens were preserved there, and further by the circumstance, that the columns are monolithic, and it would not be going too far to date its founding back to the end of the 7 th century, since moreover the temple was ornamented at great cost even at the beginning of the 5 th century.[179] (Hippocrates of Gela).

Note 179. See Cavallari-Holm, pp. 23, 84, 85, 96, 284.

4. The Artemesion in Syracuse.

At this time there remains in place only the stereobate of the pronaos with the remains and vestiges of 19 columns and the lower ashlars of two antae. The temple stood upon a substructure of 4 steps, its elongated cella similar to that of Temple C of Selinus, being hexastyle and peripteral, the inner structure (pteroma) comprising the cella with 2 columns-in-antis and an intermediate portico of 4 columns (Fig.136). A flight of 12-steps 10.96 ft. long leads up to the middle of the pediment end of the temple. The sides have 17columns, and not 16 as formerly supposed, monolithic with the architrave resting on them, which is 5.48 ft. thick and entirely plain. To this evidently belongs a dressed stone, .80 ft. wide and having 3 parallel channels of triangular section on its face, which extended above it as a taenia, as at the oldest Temple in Selinus. No vestige of regulas and drops have yet been found, nor of the frieze and cornice.

207 According to the character of its style and its peculiarities, the temple at least belongs to the epoch of the oldest temples in Selinus and in Corinth, with which it has in common the primitive heavy proportions of columns, with other things. Cavallari-Holm[180] holds the sanctuary to be one of the oldest in Syracuse, which may belong to the 7 th, if not to the 8 th century. On the eastern upper step at the facade and beneath the two southernmost intercolumniations was found an ancient Greek inscription, which has been repeatedly published and differently explained. The character of the letters indicate the 6 th century; yet its meaning relates to Apollo, consecrated gifts to whom were placed in the portico of his sister's temple, but not to the temple itself.[181]

Note 180. See the last work, pp. 78, 80, 284, 289. Figs. 136 and 137 give the ground plan and elevation of the temple, "this specimen of the most exaggerated Doric heaviness and energy".

The intercolumniations vary in size, differing on the facade and again varying from these on the long sides. The columns are thus, and especially on the sides, set so closely that their lower diameters are greater than the space between two columns.

This diversity in the distances between axes produces a lack of uniformity in the divisions of the triglyph frieze. Two solutions were possible on the longer sides' either on the assumption of uniform widths of triglyphs for the entire building, there was only a single elongated metope between two columns, or if we desire to retain the otherwise normal division of the frieze, then must the widths of the triglyphs on the long sides have materially differed from those on the ends.

On this indeed most ancient Doric stone temple, which yet belongs to the creations directly succeeding wooden architecture or mixed construction, there certainly appears the influence of Egyptian art, and especially the acceptance of the proportions and spacing of Egyptian stone columns in Grecian architecture. It is worthy of note, that here as well as at the ancient Fountain-Sanctuary in Cadacchio, at the Temples in Corinth and Assos, the regulas and drops beneath the taenia are wanting. Has this structural and decorative motive, assuredly borrowed from the ancient wooden construction, been intentionally neglected on account of the heaviness of the first stone monuments and only resumed later? But the ancient Treasury of Gelo in Olympia, that small stone structure, exhibits the regulas and mutules without drops!.

5. The Temple in Corinth.

Its facade was hexastyle; according to the reports of Dörpfeld's excavations, the number of columns along the side has been fixed at 15; it was then a peripteral structure with 6 × 15 columns, and had two separate cellas, each with its own portico-in-antis, and it therefore was a double temple. The diameters of the columns on the facade were greater than of those along the sides, being 5.64 and 5.35 ft.; the distances between axes differed accordingly. Fragments of red stucco belonging to the wall or floor of the cella were found in the excavations.[182]

Note 182. See Mitt. d. Kais. Deutsch. Arch. Inst. Athen. Abth. Athens. 1886 - 7. pp.297 to 308.

208. 209. The columns are monolithic, without entasis, have only a slight diminution and 20 flutes; they belong to the heaviest of all Grecian monuments. The capital projects widely, has a shallow abacus and 3 annulets without a hollow; the flutes intersect at the

lowest annulet in form of a flat curve. The necking is marked by 3 incisions very close to the echinus, the lower one indicating the bed-joint between the capital and shaft of the column. Of the entire temple, there now remains only 7 closely set upright columns, one of which is without a capital, five being spanned by partly ruined architrave, half of which has already fallen. The average length of the blocks is 12.53 ft.; the front surface of the architrave is set back from the line of the upper circumference of the column. The material (limestone) is quite worn away on the upper surface and is covered by cavities; no sharp edges longer remain, and no profile forms can now be accurately determined. As some places still show, the surfaces were covered with stucco.

6. Here should also be placed the ancient Temple in Tarentum discovered by Viola.

4). The Developed Doric Style.

152. Characteristics.

The works of the developed Doric style reject nearly all the imperfections and foreign elements in the architectural members, with which the monuments of the preceding periods were still burdened. A common base in the form of steps unites all the columns; the capital now consists only of the abacus, the echinus, and of 3 or 4 sharply cut and delicate bands, the annulets; the necking is limited by 2 or 3 incisions. The more powerfully developed echinus shows itself, according to Semper, "in that noble elasticity and masculine muscularity, which nowhere appears more beautifully, than in the temples at the end of this period, which already began to pass into use in the famous Attic Doric monuments". Besides the echinus, there also occurs on the monuments of the developed style the series of recurved leaves, and indeed as the crowning member of the geison, beneath the abacus of the antae-capital, with the purpose of crowning or terminating the parts of the internal structure, the entablature and the upper member of the cella wall. As a new addition should be mentioned the antae, which are attached to the walls of the cella, resulting from the endeavor to produce a more intimate union of the external colonnade with the cella, isolated in the ancieot monuments.

153. The Monuments.

1. The so-called Temple of Hercules in Akragas, built soon after the founding of the city(which occurred 582 B.C.), a peripteral structure of 6 x 15 columns with an extended arrangement of steps on the eastern end. The cella is still long and is placed between a pronaos and an opisthodome, each with a colonnade-in-antis; at the end of the cella was a small shrine for the statue of the deity; left and right of the entrance were stairs, which led to the attic. The columns had 24 flutes and were quite strongly diminished, yet were almost without entasis, the echinus was high and inclined less than 45°, but was still somewhat swelled in form, decorated beneath by 4 annulets, and with a single incision as a necking member. The face of the architrave coincides with a tangent to the upper circumference of the column. On the whole, the entablature is still high and heavy, the grooves of the triglyphs end in recurved cushion forms; the antae capitals are still of uncouth shape. The building material consists of yellowish porous limestone, the surfaces were covered by stucco.

2. The Temple of Poseidon in Paestum, a peripteral structure of the middle of the 6 th century, with 6 x 14 columns on a substructure of 3 steps, with pronaos and opisthodome, colonnades-in-antis and stairs at the entrance; the cella divided into 3 aisles by 2 rows of columns, the central aisle narrow and long (about 13.12 ft. wide).

The columns have 24 flutes, are diminished quite strongly with hardly any entasis and are inclined inward; the abacus of the capital projects widely, the echinus is not high and has an elastic curve, and there are 4 annulets and 3 incisions at the necking. The architrave is in blocks about 14.76 ft. long and lies in the same plane as the upper circumference of the columns; the triglyphs are slender, somewhat curved forward at the top, as on the Temple (C) at Selinus; the grooves end in pointed-arched
210 form, without coves at the angles; the metopes are without sculptured ornament, are broad and have head-bands of equal height with those of the triglyphs; the geison is of strong height and projection, and is decorated at top by a cove and a small bead instead of a cyma. The total height of the entablature goes into

the height of the columns 2 1/2 times. Besides the customary forms, the internal members exhibit the half round. The columns in the interior of the cella have 20 flutes on the lower order and only 16 on the upper one. (Probably arranged in accordance with the absolute dimensions of the surfaces of the columns). The outward and inward curvatures and cracks on the great horizontal architectural members are to be ascribed to defects in workmanship, easily to be recognized. The only temple in the Grecian style of architecture in which the internal construction is preserved for us in a form worthy of examination, it is also distinguished by solid construction in ashlar masonry, beautifully joined together without mortar. The same limestone was used here as in the Basilica and the Temple of Demeter, and it therefore required a coating of stucco and color. The outer surfaces are not smoothly dressed in some places; there frequently occur but roughly dressed surfaces surrounded by drafts, so that the temple cannot be assumed to have been completed in all its parts.

3. The so-called Temple of Zeus in Akragas, a colossal monument of antiquity, was a pseudo-peripteral structure with 7 × 14 columns above a peculiarly treated substructure with an arrangement of piers in the cella and of severely treated archaic atlantes for supporting the hoof. The columns were moderately diminished and stumpy; 20 flutes were arranged for the complete column, and they were 1.80 ft. wide from edge to edge on the lowest drum; the echinus was high and steep, enclosed by 4 annulets and without any incision at the necking. The face of the architrave projects in front of the upper circumference of the column; the triglyphs and metopes are high and narrow, and the cornice is massive. The metopes were without sculptures, but as described by Diodorus, the tympanums were on the contrary most richly adorned by them. The height of the entablature goes into the height of the column about 2 1/2 times. From the mighty dimensions of the temple, certain architectural members could no longer be made of single blocks; they were composed of several courses, though relatively still of great dimensions; thus for example, the architrave was 10.496 ft. high and was composed of 3 courses of stone placed one upon the

other, but the triglyph blocks of approximately equal height were monolithic; the capitals, excepting the abacus, were made of two pieces of stone, each of which measured 536.8 cu. ft.; the abacus consisted of 3 slabs placed side by side, and the drums of the columns were composed of intermediate central blocks and adjacent wedge-shaped pieces. A man could comfortably place himself within the flute of the column.

The arrangement of the interior, the entrances, and the mode of lighting, can no longer be determined with certainty.

The material employed is here again the light yellow fine-grained limestone, which was covered by stucco and painting. Its rich appointments in paintings, statues and votive gifts, were repeatedly mentioned by the ancients; Carthaginians and Siculians, taken at Himera, were employed in the erection of the temple. The temple was completed in all its parts, yet the destruction of the city by the Carthaginians (406) hindered its construction. Its last portion remaining upright fell on December 9, 1401; the mighty heap of ruins, "the Palace of the Giants", has since served as a source of supply of building stone; even in the past century, it furnished the materials for the Mole of Girgenti.

Many small members here appear somewhat uncouth. But it is not just to judge the architectural members in the same way, in case of monuments executed in porous or shelly limestone and intended to be covered with stucco, as in case of marble monuments, finished on the ashlars. It is nowhere stated, and can indeed be known in no case, that the stucco forms followed or repeated the stone forms with absolute accuracy. The coating of stucco was intended to fill up the defects of the material, and many forms on the fragments, which appear uncouth to us, having lost their coating of stucco, may have looked quite otherwise with it, - the artisans did not then proceed otherwise than is the custom today in a similar case, and which then as now results from the nature of the case. For the determination of the completed profiles of these portions of the architecture, which have lost their covering of stucco, there is consequently no longer any absolutely certain starting point.

4. The Temple of Athena in Syracuse, located on the island of

Ortygia in the harbor, was a peripteral structure with 6 × 14 (15 ?) columns. The subdivision of the much elongated cella, with columns between antae at its ends, is no longer to be determined. The columns stand close together, are strongly diminished, and are treated with little entasis and have 20 flutes; the monoliths of the pronaos are higher than those of the outer
212 colonnade. The echinus is higher than the abacus and has 4 annulets beneath it, with 3 incisions on the necking; the anta capital is heavy. The entablature is no longer preserved in all its parts; the cornice is entirely wanting, and the triglyphs are narrow; the face of the architrave is brought forward of the upper circumference of the column. The transformation of the temple into a Christian church preserved the known portions of it to us; it was built of the light limestone of the Syracusan Latomia. According to Diodorus, the date of erection falls in the era of the rule[183] of the Geomores and was therefore in the 6 th century B. C.

Note 183. See Cavallari-Holm. pp. 92, 289, 290.

213 5. The Temple of Juno Lacinia in Akragas is a peripteral building with 6 × 13 columns and is of moderate dimensions. The columns are slightly diminished; the echinus of the capital is boldly and nobly profiled, and decorated beneath by 3 annulets; the neck band consists of 3 incisions. The angle of the architrave is brought forward; the cornice and the antae capitals are lacking. The material is a yellowish porous limestone, now very much weatherworn, and formerly covered with stucco. Only 4 columns are wanting, and 16 still retain their capitals; the northern side still has its entire architrave and a few pieces of the frieze; otherwise, only a block of the architrave remains on the southern side. Fazell saw the temple while still complete, yet he complained of the shattered columns and the progressive dilapidation. The ruins received some repairs by Torremuzza in 1787.

6. The Temple in Delphi (the fifth, according to Pausanias) built by Spintharus of Corinth under the direction of the Athenian Alkmaeonides, which they caused in part to be constructed of marble, instead of the porous stone required, in order to influence the oracle in their favor, was indeed a peripteral

structure with pronaos and opisthodome. Pausanias at least mentions the "maxims in the vestibule" and a golden statue of Apollo in the "innermost part" of the temple, to which only a few had access. The figure decoration in the tympanums was by the Athenian sculptors Praxias and Androsthenes. Golden shields, dedicated for Marathon, and Galatian weapons, were suspended on the architraves.

7. The Ancient Parthenon was probably begun by Cimon and completed as to its superstructure, whose site must have been provided only in connection with the fortifications of the southern edge of the Acropolis, by substructures and filling. The structure was narrower and longer than the later building by Pericles.

8. Here is also to be placed the Temple of Zeus Olympios, also begun by the Pisistratides. only its substructure being then completed, and which was only continued by Antiochus 9" and completed under Hadrian in the Corinthian order. The still visible portions of the stylobate are constructed of white marble.

9. The so-called Temple of Concordia in Akragas is a peripteral structure with 6 × 13 columns, and is of medium size with columns arranged between antae, opisthodome and pronaos, with stone steps at the entrance and leading to the roof, with a pediment wall and a peculiarly formed opening in this above the antae colonnade. The columns are not greatly diminished, are without marked entasis, have an echinus of straight profile on the capital, a series of 4 annulets, but no incision at the necking; the antae capitals are of heavy form. The material for the temple was furnished by the yellowish limestone already mentioned; its better preservation is probably due to the circumstance, that it was once transformed into a Christian church (in the 15 th century, San Giorgio della rape). For this purpose, the cella walls were unfortunately perforated by 12 large openings with round heads, and the intervals between the columns were walled up in order to thereby produce a 3-aisled interior. The entablature of the temple is rather heavy; the columns each consist of 5 drums. it was restored in 1788 and now belongs with the best preserved monuments of antiquity (Fig. 143).

10. The so-called Temple of Castor and Pollux in Akragas was a peripteral structure with 6 × 13 columns and a stylobate of 3 steps. The Sicilian Archaeclogical Commission caused the three columns of the northwest angle with the appertaining entablature and that portion of the pediment to be rebuilt with the ancient materials. The yellowish limestone was covered by stucco; lions' heads, red and blue frets and painted palm leaves have preserved evidence of polychromy.

11. The so-called Temple of Ceres and Proserpina in Akragas, whose ruins were built into the Church of St. Blasius, was a s small cella-in-antis; only the substructure and a portion of the cella wall resting on 3 steps are still preserved; nothing now remains of the cornice and of the columns.

12. The so-called Temple of Asclepios in Akragas is still smaller than the preceding and was a double antae temple on a substructure of 4 steps. Of this, there yet remains two columns and the antae of the northern angle of the cella wall up to a height of about 16.40 ft., with most of the walls of the cella and the southern antae. No portion of the capitals or of the cornice now exists.

13. The so-called Temple of Zeus Polieus in Akragas was built into the Church of St. Maria de Greci. The remains consist of steps on the Northern side, on which rise the stumps of 8 Doric columns, together with portions of the southern substructure and a few fragments of the entablature. The temple was really a per. ipteral structure with 6 columns in front.

14. The Temple at Egesta (Segeste) was a peripteral building with 6 × 14 columns, located on the brink of a deep ravine through which flows the brook Pispisa, was never entirely completed, but so far as finished, is executed in noble proportions. Only a few foundation stones of the cella have been found; the columns are composed of an unusual number of drums (10 to 13), only roughly dressed and without flutes.still. The capital is bold and is decorated by 3 large annulets; the incisions at the necking are also lacking. The face of the architrave is set forward; the entablature and the height of the pediment are finely proportioned. The material of which the temple is built is a limestone of the vicinity, which has by lapse of time become a beautiful golden

brown, and which has well resisted the effects of exposure. The date of erection is usually assumed prior to 409 B.C., before the Carthaginian invasion put an end to the architectural activity of the Egestans.[184]

Note 184. For the study of the arrangement of stone-cutting and for the procedure of this work, no other Grecian temple affords such interesting material, as that in Egesta. By a thorough investigation with the necessary outlay of time and means, much valuable knowledge must be obtained here.

15. Of the Temple of Gela, only a single column yet remains.

16. The Temple north of the City of Himera and near the sea is a Doric structure, whose columns nearly coincide in magnitude with those of the Temples of Juno and of Concordia. Beautiful fragments of it, among which are lions' heads, are now in the Museum at Palermo.

17. The Temple (A of Hittorf) on the Acropolis of Selinus was a small peripteral structure with 6 × 14 columns on a substructure of 4 steps, with pronaos, opisthodome, and a cella divided in two parts in length, and it probably belongs to the completely developed style. The diminution of the column is slight, with little or even no entasis; 20 flutes surround the shaft; the echinus of the capital is straight and steep, decorated by 3 annulets, and the necking is indicated by 2 incisions. The lengths of the architrave blocks run from 9.216 to 10.89 ft. The proportions of the building are in general similar to Attic. A winding stairway, which was on the right of the entrance and in the first apartment of the cella, is still to be mentioned. Not a single shaft of a column of this temple has been entirely preserved; most of the stones of the one lying nearest the sea have been carried off.

18. The Temple (B of Hittorf) in Selinus, the southernmost on the eastern plateau, was a peripteral structure with 6 × 15 columns on a substructure of 4 steps, the lower steps of less height than the upper ones, with a broad flight of steps extending along 3 intercolumniations at one end, and likewise belongs to the completely developed style. The cella has the same plan as that of Temple A; the first apartment of the cella is on a level considerably higher than that of the pronaos, and the

second room is again higher than the first. The columns are slightly diminished, are animated by 20 flutes, and consist of 7 drums each. The echinus of the capital is inclined at almost less than 45°, is nearly a straight line in profile, and it has 4 annulets and a simple incision at the necking. On the other hand, the antae capital is still of heavy form. The architrave is again set back of the line of the upper circumference of the column; the blocks measure 14.596 to 15.449 ft.; the height of the entablature goes 2 1/4 times into the height of the columns; the height of the pediment amounts to 1/8 the base of the triangle. Vestiges of painting have been found in many places, and there is still a fine white stucco on the drums of the columns. Serradifalco describes one of them as painted with horizontal bands of red, white and blue. The astragal of the capital was red, the head band of the architrave was of the same color, and the triglyphs were blue; the draperies of the metope figures were colored; black and red frets on a yellow ground, and black and yellow decorations occur on the terra cottas.

The remains of sculptures (5 metopes, discovered by the English architects Harris and Angell and removed in 1831) were arranged between the triglyphs of the pronaos and opisthodome, and recall the works of the era of Phidias. The nude portions of the female figures, such as heads, arms, hands and feet, are made of white marble, all the remainder being of limestone from Memfrici. They are now placed in the Museum of Palermo beside the more ancient metopes from Selinus. Three columns of the temple still stand partially upright at the southeast angle; all the remainder have fallen.

19. Of the little so-called Temple of Empedocles (B of Hittorf) on the Acropolis of Selinus, only the foundations, the lower portions of the western rear wall and considerable remains of the side walls have been preserved to us; but nothing of the front end yet exists. According to the ruins discovered, Serradifalco explains the sanctuary as being a Doric antae temple, while before him, Hittorf, on the basis of a portion of an Ionic capital found in the vicinity, restored the temple as a prostyle structure with 4 Ionic columns before the cella, w with a Doric triglyph-frieze above them. The vestiges of color

on this temple gave for the antae and the entablature a pale yellow tone on the stucco coating; the bands of the cornice, of the mutules, and of the architrave, were painted red, the mutules themselves, the triglyphs and the regulas were blue, while the drops remained white (probably originally gilded); the grooves of the triglyphs were made a dark blue-black.

20. The Temple of Athena on the Island of Egina stood on a far visible high platform of rock, and was a peripteral structure of 6 × 12 columns on a substructure of 3 steps. The temple structure consists of cella, pronaos, and opisthodome, opening at the ends in colonnades between antae, the interior being divided in 3 aisles by 2 rows of columns, 5 in each. The columns are moderately diminished with a scarcely perceptible entasis and are surrounded by 20 flutes. The capital is still rather high and strongly projecting, decorated by 4 annulets, the necking indicated by 3 incisions. The flutes end in flat curves, their endings coinciding with the lower edge of the lowest annulet. The face of the architrave is brought forward in front of the upper circumference of the column; the entablature goes 2 1/2 times into the height of the column; the latter is 4 1/2 times as high as the substructure of 3 steps. The height of the pediment (tympanum) is 2/15 its base line; the wall of the tympanum is set back behind the face of the architrave. The angles of the pediment are decorated by griffins carved in marble, and the apex by a scroll ornament and two small figures of the same material. The famous pediment figures (now in Munich) are likewise executed in white marble, while the entire architectural portions are constructed of porous limestone, covered with stucco and decorated by painting, numerous vestiges of which are still preserved.

Regulas are found on the architraves of the pronaos and of the colonnades of the cella, while to them corresponds no[185] arrangement of triglyphs in the frieze lying above them. Above the upper colonnade of the cella, the masonry appears to have been extended to the roof, and solid blocks of stone with arrangements for connection with the adjacent courses of tiles were placed instead of gutter tiles at the junction of the wall and the surface of the roof. Cockerell explains these as being

the enclosing blocks of a hypaethron, which the smallness of the temple, aside from the previous statements in regard to this point, causes to appear unnecessary. The sun might already be quite high and still cast its rays throughout the entire length of the temple (Fig. 144). The conditions for lighting the interior were here very favorable, by means of the great doorway and the elevated site of the temple. The columns were inclined towards the cella; 21 of them still stand, much worn on the upper surfaces, in many places held together by iron bands, and partly still connected by architraves, while the frieze, geison, and the walls of the cella lie prostrate on the ground. The clamping together and the provision for setting the dressed stones are of interest.

Note 185. Did no changes in the plans occur here during the progress of the work?

21. The Temple of Aphrodite (a Temple of Athene, according to Cockerell) at the harbor of Egina, of which only the shaft of a single column now exists, but which Cockerell published as then consisting of two complete columns with a block of the architrave, was a hexastyle structure on a stylobate of 3 steps, and was also of larger dimensions than the one just described. The columns are here decorated by 20 flutes and are somewhat slender, having a height of 5 5/6 lower diameters, while their capitals exhibit forms almost identical with those of the temple discribed under 20, except that the abacus is scarce perceptibly larger than the echinus bordered by 4 annulets; the necking is indicated by 3 incisions of exactly identical form.

22. The Temple of Zeus at Olympia, more renowned for the place of its location and for the very famous and most important work of Greek sculpture placed within its walls, the chryselephantine statue by Phidias, than for its architectural beauty, was a peripteral structure with 5 × 13 columns, with front and rear vestibules-in-antis, built of native tufaceous limestone or shell conglomerate by the Elean Libon (only the roof tiles consist of Pentelican marble). The diameters of the columns frequently differ about 2 inches, and were strongly diminished; the capital has a broad abacus and "a high, soft, yet nobly profiled echinus" with 4 Attic annulets and 3 incisions

at the necking. The entablature was proportionally light; the length of the architrave blocks varies from 15.81 to 17.023 and 17.22 ft.; in width it was composed of three unequal blocks 2.56, 1.67, and 2.33 ft.; and as usually the case, the outer blocks also here abut against each other at right angles, the joint on the long side extending through, those behind it in the opposite direction. The frieze and architrave in the interior of the perioteral colonnade lie in the same plane, a vacant space was left between the triglyph-frieze and the continuous frieze. The antae capital was elegantly shaped, and consisted of a cove and a peculiar ogee leaf moulding, almost[363] exactly similar to that at Phigaleia. As in Phigaleia and on the temples in Selinus, an internal triglyph-frieze was carried above the front and rear vestibules, and this was returned as in the temples mentioned. The cella walls are constructed of ashlars carefslly fastened together by iron cramps set in lead, the lowest course being composed of blocks set on edge (as on the Parthenon, the Theseion, in Paestum, etc.), and the cella was internally divided into three aisles by two rows of columns, which in part may have been separated from each other by metallic grilles, holes for fixing which seem to appear on the lower drums of the three western pairs of columns of the central aisle.

The temple was most fully described by Pausanias among all Grecian monuments. He speaks of the gilded prize vases on the angles of the pediment, the gilded goddess of Victory on the apex of the gable, the rich figure sculptured decorations of the pediment and of the metopes on the end of the temple. He mentions Paeonios of Mende and Alkamenos, the contemporary of Phidias and nextt to him the first of artists in sculpture, as sculptors of the pediment figures. He intimates that the beastiful statue of Nike found by the German expedition was the work of the same Paeonios. But in comparison with the statues of Nike and the figures by Phidias, the pediment statues are of such inferior value, that they cannot have been the work of the same or of equally famous contemporary artists. After the image of Zeus had been completed, it may have been decided to award to the sculptors mentioned the commission for the execu-

execution of the new pediment statues in place of the antiquated and but slightly artistic ones, which was not carried out during the beginning calamities of the civil war, so that a connection arose between the names of famous artists and the ungraceful pediment sculptures, again brought to light. Pausanias likewise mentions the bronze doors, the inner colonnades set in two tiers, one above the other, by which access to the statue of the god was made possible, the winding staircase even leading upon the roof, which must have been narrow, close, and built of wood, the god being seated on a throne, his head adorned by a garland of olive leaves, and with the Nike standing on his right hand, and also the walls were decorated by paintings by Panainos, the consecrated gifts and the great altar of sacrifice. The temple and its art works sank into ruins and disappeared beneath the alluvial soil; the French expedition under Blouet merely recovered a portion of it, and the latest German expedition considerably increased the find, although the parts of the building were found to no longer rise more than 4.92 ft. above the original level of the earth beneath them.

5). The Attic Doric Style.

154. Characteristics.

The monuments of the Attic Doric style exhibit the highest perfection of form with delicately considered proportions and moderate dimensions. The columns are more slender than during the preceding period, are less diminished and swelled, have only a slight entasis, scarcely perceptible to the eye, and they are surrounded by 20 flutes of elliptical section and with sharp edges. The echinus is steeply inclined and nearly straight, and the abacus projects but a few twenty-fifths of an inch beyond it; its lower edge is bordered by 4 delicate annulets; the necking is generally indicated by a single incision.

The entablature is in the most beautiful harmony with the columns which support it; the projections of the cornice are bold; the details are delicate and graceful, partly permeated by Ionic elements. Most of the buildings of this period are executed in white marble, on which the decorative painting was directly applied. The technical skill is in them a perfected one, although slight irregularities and imperfections also occur here,

as on all works of human hands. The jointing is excellent throughout, now being almost invisible, a circumstance to be ascribed to the hardening of the joints in the course of centuries, after the disappearance of the protecting coating of color and the corrosion of the external surface of the crystalline limestone.

The dressed blocks of stone are generally fastened together by iron cramps and dowells set in cast lead, without the use of mortar.

As already stated, it is not proved to be as asserted, that the material afforded opportunity for bolder spans of the architrave and larger intercolumniations, since no Doric monument of marble attains the length of architrave in the porous limestone temple of the same order.(Compare the Theseion and the Parthenon with the Temples at Selinus, Egesta, and Olympia). The view that marble gave opportunity for more delicate treatment of the details is also not proven, for similar refinements could be executed in stucco, and as already stated under 4), 3, and we judge it to be incorrect from the profiles prepared from porous limestone, to decide upon the greater or lesser delicacy of the no longer existing stucco forms, whose frequently but rudely cut nucleus they were. (For example, merely observe the beads on some porous remains in Sicily, coated with stucco, whose nucleus is not round, but is evidently three-sided or is left in angular form, etc.).

In presence of the existing monuments, it is not correct to designate porous limestone as the Doric structural material, and to wish to derive from its peculiarities the close-spacing of the columns as a necessary result, as well as to wish to introduce marble for the possibility and for the demand for wider spans of architrave. Marble exercised scarcely any influence upon the form treatment of the facade of the Doric temple; it only did away with the otherwise usual stucco coating of slight durability, and made possible the direct application of the color to the structural material; its use was in almost all cases compelled by local conditions. Where it lay near at hand, it was employed; where this was not the case, men were satisfied with other materials, even in the best period (See Phigaleia).

Compared with the Peloponessians, the Sicilians, and the Italian Greeks, the Greeks of Asia Minor were in an incomparably better position in regard to building materials; they could earlier and more readily use marble than the former, for the reasons given. The new material produced a change only in the construction of the Doric temples; the beams of bold span and the stone ceiling of coffered slabs are results of the material. Stone beams of small cross section and a length of 21.32 ft. and coffered ceiling slabs 10.496 ft. long and 1.476 ft. thick are to be included among these. The customary ancient wooden frame-work covered with terra cotta was compelled to yield to the monumental stone ceiling, at least in the portico, in the pronaos, and in the posticum.

155. The Monuments.

1. The so-called Temple of Themis at Rhamnus in Attica (6.9 miles from Marathon), demolished by the Persians, and probably among those not required by the popular will to be rebuilt, was a small chapel-like structure on a rocky ter-
220 race about 328 ft. above the sea, and consisted of a cella and pronaos with a colonnade-in-antis. The height of the columns is 5 1/2 lower diameters; the capital still projects s strongly; the echinus has 3 annulets beneath it, while the necking incision is wanting. The masonry of the cella consists of polygonal coursed Pentelican marble, and the architectural portions of the facade are of soft porous limestone.

2. The so-called Temple of Nemesis at Rhamnus was a small peripteral structure of 6 × 12 columns with a pronaos-in-antis, built of marble, the capitals of whose columns exhibit a still steeper form of the echinus, than that on the Parthenon. The date of its erection should be placed at the middle of the 5 th century B.C.

3. The so-called Temple of Theseus in Athens (called a Temple of Hercules or of Hephaistos by others), of the era of Cimon,(?) is a peripteral structure with 6 × 13 columns on a substructure of two steps, built of white Pentelican marble and resting on a foundation of stone from Piraeus, and is located in the lower part of the city near the ancient Keramikos. The date of the erection of this beautiful temple,

one of those best preserved, is not accurately known. The coffers of the paneled ceiling bear stonecutters' marks and letters, whose forms indicate the date of about 460 B.C.[186]

Note 186. The marks here mentioned may be falsified; it is not impossible for a later individual to cut ancient marks. Proofs of this kind are always risky or even indecisive. --On the Theseion, see also Graf's essays in Baumeister's Denkm. d. Klass. Alterth., Vol. 3, p. 1774 to 1779. Munich and Leipzig. 1888. - Also, Durm's Polychrome and Constructive Details der Griechischen Baukunst. Berlin. 1880. (Also in Zeits.f.Bauw. 1879, p.111, 281, 411, 526). -- Dörpfeld makes the Theseion contemporary with the erection of the Temple of Sunion and holds that it is much later than the Parthenon, which may be true. (See Mitt.d.Kais. Deutcsh. Arch.Inst. Athen. Abth. Athens. 1884. p.336).

The temple structure consists of the simple cella with pronaos and posticum in-antis, and it was transformed into a church in the Christian period, to which circumstance is due its good preservation.

The columns are constructed of single drums set on each other, are set inclined toward the wall of the temple, have no very marked diminution and a scarcely perceptible entasis. The echinus of the capital is straight in out line, inclined somewhat less than 45°, and at its greatest projection slightly recurves toward the abacus; four delicately carved annulets surround the former, and a single incision marks the necking.

The blocks of the architrave are 8.56 ft. long, were set a little back of the upper part of the columns, and were somewhat higher than the frieze. On the latter, only the metopes of the eastern end and the four adjacent ones on the sides were decorated by reliefs; the others were left smooth, but all were set in grooves in the triglyphs. As a peculiarity should be mentioned the dissimilar treatment of the frieze on the eastern and western ends of the cella, which appears in both places as a continuous figure frieze, as in the Ionic order, and does not bear triglyphs. On the eastern end, the heavy beams of the architrave extend above the antae of the cella

to the architrave of the peripteral colonnade, intersecting these at right angles and resting on the same columns. This architrave is crowned by a moulding decorated by foliage, above which the figure composition extends from one end of the figure frieze to the other. Above the frieze is a geison decorated by fret patterns, and which is crowned by a delicate ovolo moulding. On the western end, the frieze only extends above the colonnade of the cella; the architrave and frieze are returned in narrow borders on the long sides, while the geison above the frieze over the portico extends even to the figure frieze on both sides. Corresponding to this omission of the frieze, the antae assume broader and narrower forms. Below the stone course, which projects 5/16 inch, the antae and the wall of the cella have a separate ogee base. (Compare Fig. 60, p.76).

The broad ceiling beams of the portico are arranged without reference to the columns; thin slabs of marble cover the spaces between these beams and have square openings, which in turn are closed by hollowed-out coffer blocks. This construction of the ceiling, already described in some detail, is still in part well preserved, together with its vestiges of color.

The low tympanums, which must have formerly contained figure ornamentation, are now plain and bare; the roof has fallen; a tunnel vault protects the cella from the rain, and this contained a rich collection of antiquities a few years since, but now retains merely a few plaster casts. The ashlars are wrought and joined together in the manner previously described; the surface of the marble is covered by the golden tint peculiar to Attic monuments. The columns of the peripteral colonnade each stand on an entire block of the s stylobate; beneath those of the pronaos and of the posticum, these step blocks are injured. In spite of the comparatively good preservation of the monument, it must still be added that the stylobate is defective in arrangement and is greatly injured, that the floor of the portico is partially broken away, that the columns have been cut into in many places, that very many drums are moved back from their original posi-

positions, and that the northwest angle was much injured by lightning, so that the angle column must be held together by iron bands; that the second column from the southwest angle of the western end has its drums quite turned around on each other, and the underlying portion of the stylobate is broken, and the greater number of the columns along the southern side are in the same condition. The middle block of the architrave on the western side shows a crack extending in an oblique direction through the frieze, cornice, and the entire pediment; another portion of the architrave near the southwest angle is also shattered, and the architrave and cornice of the southern side are much injured by cracks, etc. The deformations on the stylobate[3] (exaggerated in the drawing) here run in quite irregular zigzag lines; the four angles do not lie in a common plane, just as on the Parthenon. What technical importance would be possessed by the curvature of a horizontal line below the horizon amounting to about 1.181 inches in a length of 104.17 ft., or not quite 0.91 inch for a length of 44.98 ft.?

The cracks in the architrave, the piled-up columns, and certain inaccuracies in the execution, enable us to judge without difficulty of the influence exercised on these monuments by the so-called curvature.

4. The Parthenon on the Acropolis of Athens, the masterpiece of Iktinos and Callicrates, erected under Pericles 447 to 434 B.C., according to Löschke's very recent investigations, was in both form and magnificence the most important of Doric buildings in the mother-country of Greece. It is a peripteral structure with 8 × 17 columns on a substructure of 3 steps (Fig. 146), built of Pentelecan marble on a foundation partly of Piraeus stone and partly resting on the solid rock,[187] and it owes its preservation until two centuries since to the circumstance, that in the Christian period it was changed into a church. The enclosed temple is elevated above the floor of the portico by two steps and has at its ends hexastyle prostyle inner porticos with massive entrance doorways in the transverse walls. The eastern and principal entrance leads into the cella, divided into 3 aisles by 2 rows of columns, and which contained the chryselephantine statue of the Parthenos; the western leads

into an apartment with a ceiling supported by 4 columns, the treasury of the Attic state. The cella was subdivided in its length into two principal apartments. The porticos, pronaos, and the posticum are all narrow.

Note 187. The temple commenced by Cimon was narrower and longer, and therefore the existing foundation of the building by Pericles must have been extended in width about 19.68 ft. along the north side. (See Antike Denkmäler, pub. by Kais. Deutsch. Arch. Inst. Vol. 1. Berlin. 1887. pl. 1, where the plan of Cimon is drawn upon that of Pericles; also details concerning its architectural history in, Bötticher, A. Die Akropolis in Athen. Berlin. 1888, for which book were used the striking illustrations of the first edition of this volume; also, Baumeister, Denkmäler d. Klass. Alter. Vol. 2. Munich & Leipzig. 1887, p.1171; lastly, Harrison, J.E., Mythol. and Mon. of Anc. Athens. London. 1890. p. 430 - 469.

Of the two current plans of the Parthenon, by Penrose and Bötticher, the ground-plan of the former is to be accepted as correct and assured, according to Dörpfeld's examination. It is here stated that the "Athenian people understood the entire temple to be the Parthenon, but had named the treasury with its vestibule the opisthodome", while the official designations of the rooms wereopisthodome, Parthenon, hekatompedos, and pronaos. (See Cent. d. Bauw. 1881. p.340; also Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abth. Athens. 1881. pl. 12.). -- In Deltion(1890, p.92) and in the journal Adena (1890, p.627), Lolling published an inscription found on the Acropolis of Athens and interpreted by him, which refers to the old Temple of Athena, and which certainly states, that this was called to hekatompedon in the 6 th century. Hence he assumes that this also continued in the 4 th century, and it follows from this, that the different parts of the Parthenon have heretofore been named erroneously. But on the contrary, Dörpfeld (Mitt. d. Kais. Deutsch. Arch. Inst. Athen. Abth. Athens. 1890. pl. 15) explains the name of hekatompedon as only fixed for the old Temple of Athena during the period before the Persian war, and holds the given name of Parthenon to be correct.

The external columns are inclined toward the wall of the cella, are composed of drums of medium size, and are surrounded by 20 flutes of elliptical section, which intersect in sharp edges and disappear at the lowest annulet of the capital. The columns each stand upon two blocks of the stylobate, which abut at the axis of the column; they are not strongly diminished and have a slight and scarcely visible entasis; the capital has a steeply inclined and almost straight echinus and is surrounded below by 3 annulets, the necking is limited by a single incision. The surface of the architrave is somewhat inclined, and as at the Theseion, it projects beyond the upper surface of the column, is composed of three blocks in its width, and is but very little higher than the frieze, whose metopes are inserted in grooves and are decorated around the temple by figure reliefs.

Triglyphs and metopes are decorated by a beaded astragal above the head band. The cut blocks of the frieze do not closely join in the interior of the wall, but are set with interspaces, and are therefore carefully joined together by iron I-cramps. The triglyph frieze does not extend above the wall of the cella; but as at the Theseion, it is changed into a continuous figure frieze, carried around all four walls, and merely reminiscences of the former are found in the regulas with drops remaining beneath the frieze.

222 223 One may accept the explanation of Dörpfeld, that a triglyph frieze also was intended here, but was given up during the progress of the building, and after the blocks with the regulas and drops had already been completed; but it is not applicable to the portions of the frieze made of terra cotta, in which ornaments occur over the regulas and drops. The artist certainly did not there consider anything else than the taenia and regulas complete.

The frieze is crowned by a cornice composed of a moulding with leaves, a geison and an ogee moulding, on which the outlines and marks of the former painting are still well preserved.

The ceiling of the portico is higher than the geison and was only constructed of stone beams at the ends; along the sides, large coffered slabs covered the spaces between the wall of

the cella and the colonnade. The pediments were adorned by gr groups of figures, which referred to the Birth of Athene and to her Contest with Poseidon over Attica. Cymas with painted anthemion ornament extend along the pediment cornices only and end at the angles with lions' heads, above the cornice on the sides rose a continuous row of antefixas, which as already stated, had no connection with the roof tiles, but were merely ornamental. The capitals of the antae exhibit on their peculiar mouldings painted eggs-and-darts as an eccentricity; the capitals of the accurately vertical columns of the pronaos and opisthodome have but 3 annulets.

The pyramidal diminution of all architectural members, of the columns and of the walls of the cella, of the architrave and of the triglyph frieze, is carried out with considerable rigor in this building; the batter ("under the right angle") of the surfaces of the abacus (the later period follows exactly the opposite principle), and the overhang of the antae should especially be mentioned. The extremely slight entasis, not drawn in the earlier publications (which should have a magnitude of about .018 inch for a drawing of the columns 8.31 inches high) was first determined by the English architect Jenkins and then confirmed by Hoffer and others. A passage of Cicero was little considered in former centuries, but already refers to the obliquity of the axes of columns in general. For when Verres was led into the Temple of Castor, he asked what he should do there; to which the reply was made; "nothing, unless he might wish to set these columns vertical". This perfectly ignorant man asked the meaning of "setting vertical". The reply was that in a temple, there was not a single column, which was not inclined from a vertical.

The movable metallic decorations possessed by the Parthenon were already considered in treating of the architrave; transverse and rectangular holes on the centre of the architrave beneath each metope of the eastern end, as well as circular marginal traces, indicate their forms and the mode of fastening them (Fig. 147). The shields were sometimes described as taken from the Persians and dedicated by Alexander, sometimes ascribed to a gift of the orator Lycurgus, having been hung

up during his flourishing administration. The "Lachares fleeing from Demetrios" was taken down again in order to fill his treasury with the value of the metal; thus this important ornament had already been lost in antiquity.

Beneath each triglyph of this side is to be found on the architrave a number of small holes, drilled with a certain regularity, and which are assumed to have served for fastening letters of gold or bronze, but whatever was inscribed there cannot now be made out.

The rectangular holes without marginal marks or other accessories are found on the western end only above the axes of the columns, and they are therefore at the joints of the architrave and beneath the centres of the angle triglyphs, so that the decoration there must have been of a different kind.

224 Beneath each triglyph on the northern and southern sides, three iron pins 3/8 inch in diameter and bent upward were inserted to mark the angles of a triangle, and these were again intended to receive a special decoration (Fig. 147).

The intervals between the columns of the pronaos and of the opisthodome were closed by metallic grilles extending up to the capitals. Iron pins, similar to those on the architraves of the northern and southern sides, but whose purpose is not explained, are also found on the inner angle of the architrave of the opisthodome and on the sides of the capitals of the columns of the pronaos and of the opisthodome, turned toward the cella. It consider it doubtful to assume these to have been for bird screens.[188]

Note 188. See Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abt. Athens. 1889. p.233, 328.

The fate of this building, the deformation of the horizontal lines, and the painting, have all been described in various places. After its surface had been corroded, the marble was in part covered by a golden-brown lichen, especially on the eastern and western ends, while the southern side remained an almost dazzling white, and the northern side shone with a cold gray tone.

5. The Propyleion in Athens, the state portal to the temple precinct of the Acropolis of Athens, was built of white Pentel-

Pentelican marble by Mnesicles (437 - 432 B.C.) and likewise under the administration of Pericles. Proportions and treatment of form are allied to those of the Parthenon. The ent-
225 rance is decorated by pediments like a temple; its columns are likewise inclined toward the interior. The central intercolumniation is considerably wider than the adjacent ones, a and the frieze has two triglyphs above it. As shown by Hoffer, the construction of the frieze here differs from the usual one, metopes and triglyphs being wrought from a single block. The internal ceiling is supported by Ionic columns, an example of the combination of Doric and Ionic forms during the best period. The structure of the portal is externally flanked by two projecting buildings of unequal size, decorated by columns, one of which served as a guard-house, and the other was adorned by pictures and is designated as a picture gallery (Pinacotheek). The grand staircase passed between these to the entrance hall with its 5 doorways (Fig. 148). In accordance with its sloping site, the outer pediment facade of the portal was lower than the inner one, which belonged to the temple precinct. The difficulties of the location were skilfully conquered and were equalized by the flight of steps and the wall of the portal; the two pediment roofs of the outer and inner porticos no longer exist, but were probably arranged one under the other, which must be considered as a not very happy solution.

The antae capitals with the necking curved outward and the broad fillets are unique. The doorways, as shown by the reveals, were enclosed by rich borders of marble or metal, or perhaps by frame and architrave of wood, and must have been closed by bronze folding doors. The building was never entirely completed, as shown by the still unwrought steps at the entrance, as well as by the outer and inner walls of the guard-house; it is therefore surprising, that in spite of these, the painting was already finished on the upper parts, as numerous vestiges of it have been found, and again very recently on[189] the portions walled into the watch-tower, since removed.

Note 189. The lower surfaces of the drops on the geison were painted in annular form, the mutules were blue, the ad-

adjacent band red, etc.

Lightning, gunpowder and cannon balls also destroyed this astonishing structure of antiquity, of which merely the shafts of the columns and the enclosing walls are now standing.[190]

Note 190. For the building with all its details, see; & Bohn. Die Propyleion von Athen. Berlin & Stuttgart. 1882; further, the essay on this work with sketches by J. Durm; in Zeit. für Bild. Kunst. 1884. p. 291 - 301; 320 - 325; accordingly the pediments perpendicular to the portals of the north and south porticos are not to be accepted, which were given by Canina (Arch. Greca. Sez.II. Pl.117. Rome. 1834 - 41) and adopted by Bohn.-- An essay in Deutsch. Bauz. 1886. P. 19, gives interesting conclusions relating to a possible original design by Mnesicles. Also see Harrison, p.35, and especially Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abt. Athens, 1885, pls. 2, 3, 5, from which we reproduce in Fig. 149 the existing building and very probably the original plan. Dörpfeld's restoration of the elevation is also spirited and satisfactory, and rejects the pediment of Canina.

6. At the same time and under the same administration with the Propyleion and the Parthenon, there likewise arose the Telesterion in Eleusis, of which scarcely any remains worthy of notice still exist there; it was a white marble structure designed by Iktinos, whose ground plan has already been described.

7. The Temple of Apollo Epicurios at Bassae or Phigaleia in Arcadia (shortly after 430 B.C.) was erected in gratitude for averting a pestilence and was a peripteral structure with 6 × 15 columns on a stylobate of 3 steps, executed in a light bluish-gray limestone, and was built from the designs of the famous architect of the Parthenon (Fig.149).

Pausanias states that together with its roof, it was of marble (limestone ?), and in consideration of the beauty of the stone and its jointing, describes this as the most beautiful of the temples in the Peloponnessus, after that of Tegea. The cella has a pronaos and a posticum, both in-antis, and is in its length divided into two apartments, the front one of these having pilaster-like projections along its sides, whose edges are treated like Ionic half columns and extend to the ceiling.

The second and smaller room is separated from the former by two oblique piers and a central column, and it has a separate entrance from the side. The central column exhibits a Corinthian column (perhaps the earliest use of this in Greece), so that all three orders occur together in this temple, distinguished by its beautiful proportions and details. More recent investigators prefer to consider the middle cella with columns as an uncovered court; I cannot adopt this assumption, on account of the smallness of the plan. The steps of the stylobate differ from the simple form, since they exhibit three slight recessions on the lower part; the same treatment is repeated in a unique way on the projecting lower course of the wall of the cella. The columns are surrounded by 20 flutes and are somewhat more than 5 lower diameters in height; they stand absolutely vertical and have no entasis; like those of the Temple at the harbor on Egina and those of the Temple at Corinth. The orientation from south to north is remarkable and contrary to rule.

Every possible little refinement, "pleasing to the eye", which is"perceptible to the senses but scarcely apparant to the eye", is here omitted, yet the temple exerts an undying spell, like that of the Parthenon, the great work of the same
226 architect.

227 The capital even projects somewhat less than that of the Parthenon, and the echinus is decorated beneath by 4 annulets; the necking is marked by 3 incisions. The antae are diminished and have in the treatment of their capitals something allied to those of the Temple of Zeus in Olympia. The tympanum and the metopes of the external colonnade are left plain, while those on the ends of the cella are decorated by reliefs; the triglyph-frieze is returned at the angles, but does not extend along the sides (Fig. 150).

The more important sculptured ornamentation is here placed in the interior, an animated and richly composed figure frieze extends along above the series of Ionic columns.

The Ionic-like cyma is decorated by sculptured anthemions and only extends along the inclined cornices of the pediment, terminating with lions' heads at its angles; antefixas are

here terminations of the covering tiles and ornament the cornice on the sides. The coffers are not all of similar form; square ones (of different sizes) alternate with those of lozenge shape.[191]

Note 191. For the origin of the plan, see Baumeister. Vol. 3, p.1319 -1324; and concerning the primitiveness of the Corinthian column, see Annal.d.Inst. 1865. p.45, 61.

8. The Temple of Athene on Cape Sunion was a peripteral structure with 6 columns on the facade and 13 on each side. Those existing are of slender proportions, nearly 6 lower diameters high and with a noble treatment of the capital; 3 annulets enclose the steep echinus; a single incision cuts off the necking; 16 flutes surround the shaft in an exceptional way. This temple had about the same dimensions as those of the Temple on the Acropolis of Egina, and it was built of white marble; of it there still stands, deeply corroded by the ocean breeze, 11 columns of the colonnade and an anta with the column appertaining to it, all supporting architraves. Numerous remains cover the ground; 7 courses of the carefully joined substructure are exposed at one side. See in Mitt. d. Kais. Deutsch. Arch. Inst. (Athen Abt. Athens, 1884) Dörpfeld's report of the excavatiins and his drawings (Pls. 15, 16; pp. 324 - 337), according to which the plan of an earlier temple of porous stone was found beneath the marble temple, whose stylobate and steps were even better preserved than those of the later temple. Nine columns still stand upright and support a portion of the entablature. the plan of the interior of the temple can no longer be determined.

The sketch published by Blouet at the time is to be regarded as in general satisfactory. As already stated, the building might be contemporary with the Theseion at Athens.

9. The Propyleion at Sunion is a simple hall-like structure with columns-in-antis at both pediment ends and triple doorways.

10. The so-called Hall in Thoricos is a peripteral colonnade of 7 × 14 columns, whose purpose as a temple is not settled. Remains of columns show the flutes still unfinished.

8. Late Doric Style.

156. Characteristics.

The late Doric style abandons in great part the expression of a "typical monumental exaltation" and opens for itself new paths of development in the direction of "light decoration and graceful attraction". The columns become very slender and almost attain Ionic proportions; the echinus of the capital exhibits a lower and nearly straight profile; the annulets become very delicate, the single incision for the necking remains or is omitted; the entablature is correspondingly light in its arrangement. On structures belonging to the end of this period, the abacus of the capital usually receives a crowning ovolo moulding; the annulets frequently give place to small doubled astragals, the grooves of the triglyphs exhibit various dry or labored terminal forms, the surfaces of the triglyphs are used for an overloading with figure or vase ornament; the head-band of the triglyphs and metopes also receives a small ovolo moulding; the mutules disappear in elevation on the undercut surface of a water drip.

157. The Monuments.

1. The Temple of Zeus at Nemea (date of its construction unknown) is a peripteral structure with 6 × 13 columns on a stylobate of 3 steps, the cella with pronaos and posticum in-antis being built of grayish white crystalline limestone, now covered with a dark lichen on a weather-worn surface.

The columns are slender, have a slight entasis, and are constructed of separate drums, whose lower diameter has the considerable magnitude of 5.15 ft.; 20 flutes enclose the shaft;
228 the echinus of the capital is low and steep, and is decorated by 4 annulets. Three columns are still standing, two of which belonged to the pronaos and now support a fragment of the entablature, a cracked architrave block with a shattered triglyph above it, which with one adjacent metope is made from a single block, while the other abuts against it. Hence the complete triglyph frieze was extended above the pronaos. The pavement of the temple is still preserved and is entirely covered by massive fallen ruins. The details do not appear entirely flat, however, and the ruins still leave an imposing impress-

impression on the observer.

2. Of the Temple of Nike at Messana, the fragments scarcely suffice for determining the arrangement of the temple. The columns were diminished but little, the echinus was steep and straight with 3 annulets. The abacus was crowned by a moulding; there was no incision at the necking; the mutules of the cornice were sunken.

3. The Portico of Philip on Delos exhibits proportions and treatment of details similar to those described under 1 and 2.

4. To the 4 th century B.C. must also belong "a great Temple (shown by the excavations to be small) in Olympia in the Doric style, and which has the name of Matroon", by Pausanias said to contain the statues of the Roman emperors, and a Temple in Lepreon, that agrees with former in a high degree in both dimensions and shape.[192]

Note 192. See Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abt. Vol. 16. p.259, 260. Athens. 1891.

5. The Propyleion in Eleusis was built of Pentelican marble and was a bad imitation of the Athenian. The detail on this was frivolously executed and was no longer delicately designed. Further:--

6. The Stoas of the Pergamenian princes, that of Attalos in the Cerameikos, and that of Eumenes II between the Theatre of Dionysos and the Odeion in Athens, only the substructures and fragments of both being preserved.

7. The little Sanctuary of Esculapios and of Themis on the way from the Theatre of Dionysios to the ascent to the Acropolis, whose remains were recently laid bare by the removal of the rubbish heaps on the southern side of the rock of the Acropolis. The capitals found there partly have crowning mouldings on the abacus and partly astragals instead of annulets.

8. The Market Gate in Athens, a beautifslly executed marble structure, built between 12 and 1 B.C., of which 4 columns and one anta still exist, together with the entablature resting upon them, and the pediment, whose cornices have partly fallen; according to the inscription on the Architrave, it was built with funds given to the Athenian people for the purpose by Caesar and Augustus, and it was dedicated to Athene

Archegetis. The columns are slender, like those of Nemea, are slightly diminished and have little entasis, standing with intervals of unequal width, leaving a central passage as in the Propyleions, and with the same arrangement in the frieze. 20 flutes surround the shaft, constructed of 6 drums; the echinus of the capital is rounded and low. On the apex of the pediment stood a statue of L. Caesar, grandson of Augustus.

9. Doric ruins on Samos, whose original purpose is unknown, show columns with Ionic bases, abacuses; triglyphs and metopes with a crowning moulding, and sunken mutules on the cornice.

10. On the fragments of a structure on the Agora in Priene, the flutes are separated from each other by broad fillets and end square; beneath the echinus are two astragals; the abacus has a crowning moulding (Fig. 151) with a similar one on the triglyphs and metopes, the first of these showing peculiar endings for the angle channels. The mutules on the cornice are also sunken here.

229 11. The remains of the Temple at Myus (Asia Minor), which indeed come from a small temple-in-antis, in part exhibit forms allied to those described under 9. The city was already so much destroyed in the 2 d century A. D., that the Temple of Dionysics of white marble was the only building still standing. The regulas are not returned on the angles of the latter, and a drop is placed at the angle. The metopes have no separate head-band, like the triglyphs, but only a crowning moulding, and are broad in comparison to the triglyphs. On one block, the grooves of the latter are formed without coves; on another, they show a triangular treatment on the angles. The mutules of the geison are also wanting on the last block, while they are again sunken on the former. (See Fig. 151 in reference to the capital).

12. The Capitals of the columns of a two-story colonnade in Solunto (Sicily) exhibit the same low echinus as on the monuments described, with a unique termination of the flutes and 4 graceful annulets.

230 13. Semper likewise places here the Portico of the Peribolos of the Doric Temple at Pompeii with its peculiar profiles of strongly Ionic tendency.

14. Of the buildings of the Sicilian Tyrants, there have come down to us in the parts of a stylobate of steps and a Doric entablature, the remains of a colossal altar structure, which was a stadium in circumference, and was erected by Hiero II in Syracuse (275 - 215 B.C.). Of architectural interest is the statement that Hiero's magnificent colossal ship had atlantes figures 6 yards high, which supported a triglyph f frieze and a balustrade.

15. The so-called Hall of the Bulls on Delos, on the east of the great Temple of Apollo, extends from north to south with a length of 220.42 ft. and a width of 29.06 ft. The building is ascribed to the best period and is the one best preserved on Delos. The enclosing walls rest on three marble steps, still partially remaining, that are built on a foundation of granite and extend along both sides and the northern end of the building, while a Doric portico was placed before the southern end (Fig. 152, from a drawing by Nenot). The interior consisted of a very long hall with a basin sunk in its floor and a shorter room, in which an altar actually stood. The two apartments were separated from each other by a row of piers with half columns, whose capitals consisted of kneeling bulls and of the normal Doric capital (Fig. 153). According to the later excavations and researches, the use of the bull capital earlier published by Stuart and Revett is to be accepted no longer.(Also see the Roman Theatre in Verona).

In the northern part of the hall must have stood the horned altar of Apollo (keratinos bomos), once esteemed by the ancients as one of the seven wonders of the world. The internal walls were perhaps decorated by a continuous frieze, fragments of which are still preserved in the Museum at Mykonos.

16. The Heraion in Argos.

An upper terrace, whose southern side was built of massive and almost entirely rough blocks of conglomerate, bore the old Heraion. The older Temple was burned in the 89 th Olympiad and was rebuilt by the architect Eupolemus under the direction of Polycleitos, who made the famous chryselephantine colossal statue of the goddess for it. The walls of the cella consisted

of whitish gray limestone. The temple itself appeared as a Doric hexastyle peripteral structure furnished with rich figure decoration in Parian marble, likewise showing this material in the metopes, pediment, on the roof and gutter cornice. A piece of this cornice shows anthemion ornaments, between these being a small bird.[193] In the source mentioned below, the lower diameter of the column is given as 4.26 ft., the width of the flutes as .66 ft., and the masonry is said to have been covered with a coating of stucco.[194]

Note 193. Scavi dell. Heraeon Argive. Lett. al Dr. Henzon da Bursian. Bull. d.Inst. 1854. Part 2.

Note 194. Later notices referring to this building are to be found in Bursian, C. Geographie von Griechenland. Leipzig. 1868. pp.47, 48, et seq.

7.Recent Discoveries.

158. Monuments.

1. The old Temple of Athena on the Acropolis of Athens was excavated in 1886 by Kabbadios and Dörpfeld. The temple consisted of the peripteral portico, the vestibule, the 3-aisled cella, and the opisthodome with two treasure chambers. The foundations of the cella and opisthodome are built of the solid blue limestone of the Acropolis, and those of the outer colonnade and of the stylobate are of Piraeus limestone; according to the finds, the other parts of the building were of porous limestone, the pediment cornice, roof tiles and metopes being made of white marble. The temple was a peripteral structure with 6 × 12 columns, according to the restoration by the investigators mentioned.(Fig. 134).

The structural parts were partly built into the front wall of the Acropolis, and were partly found in the excavations. They are combined on the plates mentioned below to form a whole in a credible manner.[195] The columns had 20 flutes, 4 annulets, and 4 incisions; the depth of the foundations vary about 9.84 ft.; the temple stood on a single step.[196]

Note 195. See Mitt.d.Kais. Deutsch. Arch. Inst. Athen Abt. 1885. p.275; 1886. p.337; also Antike Denkmäler pub. by Kais. Deutsch. Arch. Inst. Vol.1. Berlin. 1887. Pls. 1, 2.

Note 196. See Dörpfeld & Petersen. Baugeschichte des Temp-

Tempels. Mitt.d.Kais. Deutsch. Arch. Inst. 1887. p. 337 - 351; 1887. p. 25 - 61, 61 - 72. -- The entire building was termed "Hekatompedon" in the 6 th century; its rear portion served as a "tameion" and contained several chambers. See Lölling; Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abth. Athens. 1890. p.627; also Dörpfeld, same, p. 420 - 439; further, Hermes, 1891, p.472.

2. The Temple of Apollo on Delos was a Doric building with 6 × 13 columns from the end of the 3 d century, the ceiling of its portico being entirely constructed of wood and not of marb-
23/le. The ceiling of the front portico contained 15 coffers, formed by intersecting transverse and intermediate beams, and 3500 drachmas were paid for it. The vestibule walls were covered by thin elm boards, which projected out little from the face of the wall.[197]

Note 197. See Homolle. Comptes et Inventaire des Temples Delianr en l'annee 279. Bull. d. Corresp. Hell. Athens and Paris. 14 th year (1890). p. 462 et seq.

3. The Sanctuary of Leto on Delos was a small structure of similar style and age.[198]

Note 198. See also; Zeit. f.Bild. Kunst. 1885. p. 202.

4. The Circular Building of Arsinoe on Samothrace. Aside from the foundations, not a stone of the circular structure remains on another. The building was perfectly circular; the on chief parts of the superstructure were executed in white marble, consisting of a substructure of smooth ashlars and of a series of free piers set thereon, which supported the entablature and the conical roof; marble slabs filled the spaces between the piers. The latter exhibit the form of Doric antae externally, while Corinthian half columns are attached to them inside. The external entablature was also Doric, and it shows undeveloped Ionic forms internally. According to Niemann's drawings, a light cap and a frieze of palm leaves extends between the substructure and the series of piers., around both the interior and the exterior, its remaining portions havvvg both sides wrought from the same block of marble. The numerous fragments found of a second similar frieze must belong to the socle. The height of the ashlar substructure cannot now be fixed, and the data for the mode of constructio of the roof are likewise lost. We find in this example also, as in all circular temples cited,

that the Corinthian order was employed in the interior.[199]

Note 199. See Conze & Bennsdorf. Untersuchungen auf Samothrake. Vol. 1. Vienna. 1875. pp.79 - 87; pls. 54 - 67.

5. The Temple of Dionysios in Pergamenon was a tetraprostyle structure, the shafts of its columns being covered by 20 flutes. It is an interesting example of the free treatment of forms in the Hellenic period.[200]

Note 200. See Deutsch. Bauz. 1885. p.175. Also, Bohn. Dritter Verläufige Bericht über die Ergebnisse der Ausgrabungen zu Pergamon. Jahr. d.Preuss. kunstsamml. 1889. p.38.

6. The Temple of Athena in Pergamon. A peripteral building with apparently 6 × 10 columns, pronaos and opisthodome, and of the 4 th century. The columns diminish with slight entasis from 2.463 ft. lower, to 1.984 ft. upper diameter. The drums were dressed smooth and the flutes were merely commenced on the capital block.[201]

Note 201. See Alterthümer von Pergamon. 1875. Vol. 2. p.5 - 25.

7. The Temple of Demeter and Kore in Aegae was a small antae temple 31.82 ft. long and 21.32 ft. wide. The lower diameter of both columns was 1.87 ft., and their shafts were covered by 24 flutes each. The inscription found indicates by the forms of the letters the 2 d century B.C., with which the dry architectural forms agree.[202]

Note 202. See Bohn & Schuchardt. Alterthümer von Aegae. Berlin. 1889. p. 41 et seq.

8. The Temple of Athena Alea in Tegea. A peripteral temple with 6 × 13 columns, on which all three orders were employed. The exterior had Doric columns, the pronaos Corinthian, and the cella Ionic columns. It was not the largest temple in the Peloponessus, as Pausanias incorrectly states.[203]

Note 203. See Adler. Der Tempel der Athena in Tegea. Cent. d. Bauw. 1882. p.92, 97. Also, Mitt. d. kais. Deutsch. Arch. Inst. Athen Abth. Athens. 1888. Pls. 13, 14; 1880. Pls. 2, 3, 4.

9. Temple of the Kabires on Samothrace. The peculiar groundplan is given in Fig. 134 in the comparison of the kinds of temples, and it is to be made especially prominent, that the longitudinal axis of the temple extends from north to south. The cella

walls are built of thin and high courses, and the columns are constructed of single drums. The facade of the temple has the greatest similarity to that restored from the ruins of the Temple of Nemea. The rich ornamental acroteria of the pediment is interesting.[204]

Note 204. See Archaeologische Untersuchungen auf Samothrake. Vols. 1, 2. Vienna. 1875 and 1880.

10. The Grecian Temple in Pompeii. A peripteral (pseudodipteral ?) structure with 6 × 11 columns, a small cella and pronaos, on a substructure measuring 88.64 × 56.42 ft. The shafts of the columns were surrounded by 18 shallow flutes, not carried down to the step of the stylobate, but ending on a narrow band. Cavallari found the same arrangement on the Fountain-house of Ovane, which had a band 4 1/2 ins. high.[205]

Note 205. See Appendice alla Topog. Archaeol. di Siracusa. 1891. p 49.

The moderately rounded and projecting echinus is bordered beneath by a narrow fillet and a cove.[206]

Note 206. See Duhn & Jacobi. Die Griechische Tempel in Pompeji. Heidelberg. 1890.

232 11. The Temple of Asklepios in Epidauros. A peripteral building of similar unusual proportions with 6 × 11 columns, that stood on a substructure of three steps, 80.38 ft. long and 43.3 ft. wide. The lower diameter of the columns was 2.95 ft.; the distance between their axes was 7.38 ft.; 20 flutes surrounded the shaft of the column. The temple building consisted of pronaos and cella, the opisthodome being omitted. The cella was not divided into 3 aisles on account of its narrow width. The roof was covered by marble tiles. The wooden doors had on their external sides a special decoration by ivory inlays(see the building contract). Theodotus was employed as architect, Astias as assistant architect, and Timotheus as sculptor.[207]

Note 207. See Kabbadias in Praktika, years 1882, 1883, 1884, and the drawings therein by Dörpfeld and Kawerau; also Baunack's epigraphic essay; Aus Epidauros. Leipzig. 1890.

12. The Tholos in Epidauros. A circular structure by Polycleitos with a Doric portico and an internal Corinthian colonnade, from which comes the beautiful marble capital recently

made known.[208] The French archaeologists see a Fountain enclosure in the peculiar course of the foundation walls in the interior of the cella, this would otherwise be necessary to support the floor slabs.

Note 208. See Praktika, years 1884, 1885. Reconstruction therein by Dörpfeld. Also in regard to the capital; Ephem. Archaeol. 1885. Pl. 10.

13. The Choragic Monument of Nikias in Athens. This was a large structure with 6 Doric columns on the front; the dedicatory inscription is placed above the three middle intercolumniations. On the side facade was probably placed an angle column, and a second column beside it, while the remainder was occupied by an unbroken wall; the face of the rock probably formed the rear wall, as at the Choragic Monument of Thrasyllos.

The architraves consisted of white Pentelican marble, the triglyphs were of poros stone, while the metopes were thin slabs inserted in grooves, and the cornice was again of Pentelican marble. The building was crowned by a pediment, and this had the form of a temple; the so-called Beule's Gate was built of its ruins.

The Technics of the stonecutting and setting are not inferior to those of the buildings of Pericles; dowells and I-cramps alternate in fastening the stones together. On uncovering the doorway, many vestiges of painting were found on the parts of the building in question, especially of blue on the triglyphs and on the slabs in which the drops were cut.[209]

Note 209. See Mitt. d. Kais. Deutsch. Arch. Inst. Athen Abt. Athens. 1885. p. 219 - 230; pl. 7.

Chapter 2. The Ionic Order.

a. Development.

159. General.

The civilization of Assyria and of Egypt had already been highly developed for a long period before the forest covered shores of western Asia and of the islands adjacent thereto could exhibit results in the domain of architecture, that proved a similar culture and intellectual development of their builders, as in the countries first mentioned. Civilization

had indeed proceeded very far in both centres of culture, when it first commenced to dawn in Greece and Asia Minor.

Peoples emigrated from these centres at an early date, attracted by the favorably located plains of western Asia and the fine climate.

Fifteen centuries before Christ, we see the Egyptian princes of the 18 th dynasty undertaking campaigns into western Asia, also Rameses the Great two centuries later, and two centuries
233 later still, a movement of the people from Asia toward Europe was reflected back from the neighboring European Greece upon the Asiatic islands and coasts.

The Aryan and Semetic races met and mingled there; Assyrians and Egyptians left their traces; the mobile Semites and the people of Tyre and Sidon there carried on traffic with distant races in the interior and on the coast.

Under such conditions, the art style that developed in this country received necessarily a peculiar stamp, but still lacked originality.

160. Wood Construction; Mixed Wood and Stone Construction.

For building, there existed in this province a superabundance of wood and of stone; Aryan wood construction and Semetic stone construction are here found beside each other. The ancient wood construction is proved by its imitations on the Lycian and Carian rock-cut tombs.

In the mixed construction, the walls were built of regular and irregular stones, the door and window frames, the ceilings and roofs, and even free pillars, were of wood, while the roofs were covered with mixed straw and clay, later with burned tiles. The easily wrought wood led to the use of sculptured ornament; its lack of durability required a protecting coating, which was in the form of a covering with color, as rich painting in striking hues, or it consisted of a covering of metal and terra cotta.

161. Proofs.

The massive quays, terraces, and stone rampart walls in western Asia, that supported the warehouses and storehouses of the Phoenician merchants, slightly built of wood or of mixed stone and wood construction, or served to form or protect harbors and landings, and the mighty temple terraces of Jerusalem, still

supply in their ruins eloquent evidences of the stone style of the Semites prevailing in western Asia at an early date. The element, to which these merchants owed their place and power, required massive and monumental fortifications against its might, as well as the prevalence of the easier use of wood in the preparation of the equipment for traffic. In their chief settlements, and with reference to their business and the manner of their acquisition of the country, it became necessary to see that it afforded both materials in abundance.

Certain Cypriote buildings likewise are evidence of a mixed wood and stone style, in which are found free wooden pillars between stone bases and capitals.

We learn from Strabo, that on account of the lack of stone in Babylon, columns were made of palm trunks, which were covered with reeds and stucco and then painted. The Bible informs us concerning the erection of the Temple and Palace of Solomon, that their foundations were "of costly stones, cut to the square, their wood-work sawn with saws, on all sides, from the ground to the roof."

The king of the Jewish people, skilled in stone construction, turned to the Tyrian Hiram with the request; "Command that cedars be cut in Lebanon---, for thou knowest, that there is none among us, who is skilled in hewing wood, like the Sidonians." He covered Temple and Palace with cedar wood, built "cedar" partition walls, wainscoted within the entire Temple with "cedar alone", ornamented it with turned knobs and flower-work, "so that no stone could be seen." He then covered the wooden portions with pure gold, had carvings ex-
234 ecuted thereon, sculptured cherubim, palms and flowers; the doors were carved in olive wood and overlaid with gold plate. The bronze-founder Hiram from Tyre, the son of a widow of the tribe of Naphthali, cast for him the two columns Jachin and Boaz, placed before the portico of the Temple, with their richly adorned bronze chapiters. He built his own Palace with "cedar" columns; its porticos were constructed of columns and heavy beams. (Kings; V, 6; VI, 10, 15, 16, 18, 21, 29, 32; VII, 6, 9, 15.

What has been deduced for Cyprus and the Asiatic coast east-

eastward thereof, may indeed be assumed also for the coasts of Asia Minor lying north and northwest.

162. Decadence of Wooden Architecture.

The original wealth of the country in wood was somewhat lessened in time by traffic in logs and lumber, by its use in building ships and structures, and by employment as fuel; moreover irrational or defective cutting thinned the forests; cedars, cypresses, and sycamores, were at command in ever lessening quantity.

These circumstances, combined with the lack of durability of this building material, in time permitted the richly abundant and more resistant stone to become more prominent, at first for structures serving for elevated purposes, and in this way the mixed mode of building gave place to one more nearly of stone. Meanwhile wooden columns were set on stone bases, that raised them above the damp pavement and thus protected them from dampness, or they received a protecting coating, before they gave place to stone pillars, to which the character of the former was transferred in both form and proportions.

163. Stone Architecture; Facades of rock-cut Tombs.

The date of the completion of the innovation can scarcely be accurately determined here; how it was completed may be seen on Lycian and Carian rock-cut tombs. The ancient terrace roof there first gave place to that with rafters or the gable roof; the closely set round trunks were replaced by squared timbers set farther apart; the old wooden pillars gave place to the columns, and the wooden abacus over these, to the volute capital. But these changes were not perfected before Lycia entered into closer relations to Greece, before it was incorporated in the Ionic satrapy (515 B.C.). The inscription on the Tomb of Amyntas is not considered earlier than 400 B.C., and it cannot be assumed to be a later addition.

As repeatedly explained, the tombs represent the habitations of the living, and in accordance with this law, the well built wooden cabin, as slavishly imitated in the rock-cut tombs in even the smallest detail (both in relief as well as

if detached), prevailed, and with it wooden construction as well. Its structural elements were recognized on the tombs at the same time by Niemann and Dieulafoy (1884) and were technically explained, when they pointed out in the triple series of beams corbelled out at the ends and over the round ceiling beams, the ties preventing the sliding of the terrace roof, covered with rubbish and straw mixed with clay.

The erroneous idea of Semper can no longer be held, that the Lycian rock-cut tomb is to be regarded as a monumental funeral pyre, and to which we adhered for a time, in consequence of the preceding statement and of the most recent examinations of these monuments by Benndorf, Niemann, Petersen, von Luschan, as well as the conclusions and comparisons with
235 ancient Persian architecture by Dieulafoy.[210] The temple facades of Lycian tombs (Fig. 154) cannot therefore be longer regarded as a transition stage of Ionic stone architecture. Their value to art history "will not be annulled thereby, scarcely be lessened perceptibly, but rather assured in the chief matter. They remain as proofs of an early phase of the development of the Ionic style, though not as originals, but rather as indirect copies".[211]

Note 210. See Benndorf & Niemann. Reisen in Lykien und Karien. Vienna. 1884. Also, Petersen and von Luschan. Reisen in Lykien, Milyas und Kibyratis. Vienna. 1889.

Note 211. See Benndorf, p. 113.

The completed stone structures of the Ionic order owe their origin to a mixed stone and wood construction, just as already explained in the case of the Doric order, but with the difference, that the slender proportions of the wooden structural parts in this change, without requiring their transformation by the introduction of a foreign element, like the massive Egyptian stone columns. By a change in magnitude, the architectural members over the columns were retained with their original functions, when the new stone ceiling was allowed to rest on the architrave and was not, as in Doric stone architecture, raised to the height of the cornice, making its future position to be recognized ornamentally in the frieze.

164. Characteristics of the Order.

The characteristic peculiarities of the new order are then:-
236 slender columns standing on separate richly moulded bases and accented by vertical semicircular flutes separated from each other by fillets, crowned by the volute capitals as shown, and spaced uniformly and further apart, but set vertically; a plain frieze, or one sculptured with figures, without architectural breaks; a simple projecting cornice with deeply undercut water-drip, and that sometimes rests on the well known so-called dentils, the placing of the beams of the portico ceiling directly on the architrave.

A frequently added criterion, "a wider and lighter architrave, columns further apart and more slender", is only true concerning the greater lightness of the former and the slenderness of the latter. On the boldest Ionic temple, that of Apollo Didymeos in Miletus, the columns stand closer from centre to centre, than at the middle interval of the Doric Propyleion in Athens; the intercolumniation of the heaviest Doric temple in the Peloponessus, that in Corinth, is equal to that of the Ionic colonnade in the Athenian Propyleion (Fig. 155).

165. Occurrence of the Order.

As already shown, the earliest knowledge of the countries of Asia Minor and of the adjacent islands extends back to about
237 the middle of the second thousand years B.C.: the earliest very simple architectural productions must indeed have been of native origin; the later received richer forms and changes through Phoenician, Assyrian, and Egyptian influences, and attained by the addition of Grecian elements a higher perfection of form. Transplanted to European soil, the treatment of details in the Grecian mother country reached the highest degree of perfection and refinement.

No Ionic monument of the earliest period, built of stone, longer graces the soil of Asia Minor; the natives of inner Asia, the Medes and Persians, pressing toward the sea, destroyed them; the greatest sanctuary, the earlier Artemesion in Ephesus, was ruined by the rude love of fame of a foolish man, even in the period before Alexander.

166. Remains.

With the exception of the Lycian and Carian rock tombs belonging here, all that has come down to us dates from the era of Alexander or that of the Diadochides. Likewise much from the period of Roman supremacy.. Only on European soil, in Attic provinces, are preserved for us a number of charming creations from the highest period of Greek art, although even in ruins; in lower Italy and Sicily, we meet with but scanty remains, of which the best consist of some capitals of porous yellow limestone.

167. Material and Polychromy.

The remains of the monuments of this architectural style all indicate a perfected marble style; one seldom meets with structures of porous limestone coated with stucco, and these are mostly outside Asia.

The monuments of this style likewise were embellished with the gleam of rich gilding and the splendor of colors, as sufficiently proved by vestiges and by traditions.

168. Magnitude of Temples.

Without change or variation of details, the temples occur in all possible dimensions, from the smallest, chapel-like,
238 Temple of Nike Apteros at Athens to the gigantic structures of Miletus and of Ephesus. The same forms were employed at the small, as at the large scale, just as the case was in the Doric order likewise (Fig. 156).

169. Civilization.

Western Asia was the country in which Semetic and Hellenic civilizations most intimately combined. The information given by the Bible concerning the arrangement of Solomon's Temple must therefore accord in a higher degree with the Asiatic-Ionic temples, than with the Hellenic-Doric previously described.

Finally, if we confirm Braun's axiom, that "the Ionic style belongs to Nineveh, perhaps even to Babylon; for it was already the common style of Asia at an ancient date, not to be computed, - it is a powerful style, whose envoys may be traced into Asia Minor, along the Phoenician coasts to Carthage, and even into innermost Africa", we may reject the Vitruvian

fable of the invention of this style (Book IV, Chap.1) and his explarations of the volutes as coiled tresses of women's hair and of the flutes as the folds of garments.

b). Form and Construction of Main Parts.

Like the Doric, the temple of the Ionic order rises above the ground as a substructure of several steps and is substantially composed of the same elements, and is similar in plan or is allied to one of the developed schemes.

170. Substructure.

1. The substructure (Stylobate) in Attic Ionic monuments consists of 3 steps, either of plain form as in most Doric structures, or more richly treated by a recession, as on the little Temple of Nike Apteros in Athens (Fig. 157). We generally find higher substructures in temples in Asia Minor, following models in inner Asia. On the Temple of Magnesia, for example, these were arranged in 5 steps, at Aizani in 7, and on the Artemesion in Ephesus in 10.

Curvatures have yet scarcely been shown to occur in the stylobates of Ionic monuments. Athenian structures are free from them; but they are recently asserted to occur on the Ionic Temple on the terrace of the Theatre at Pergamon.

171. Cella Walls.

2. The walls of the cella do not rest directly on the pavement of the portico, but on a continuous richly moulded base, whose section is usually imitated from that of the bases of the columns; they are terminated or crowned at top by a cap, that in part shows the members of the antae capitals.(Fig.158).

239 The walls are not inclined but are strictly vertical and are built of coursed stones, that exhibit on their beds and ends the same mode of working as the ashlars of Doric monuments, and which are connected together in the same manner by dowells and iron I-cramps (Fig. 159). On the Temple of Nike, the Temple of Artemis Leukophryne in Magnesia and others, the ashlars of the cella are all through stones; in Miletus, the middle of the wall consists of rough stone masonry; merely the external surfaces of the walls 8.95 ft. thick are formed of large blocks of grayish marble.

On the external surface, the height of the coursed ashlars

are to their length as 1 to 2.7 or 3.

The lowest course is in Athenian buildings higher than the others, just as in Doric (see Parthenon, Theseion, Paestum, and others), and it projects 3/8 inch from the wall surface at the Erectheion. The fillet with the apophyge is there cut on this course (Fig. 160).

A fret band extends along at the height of the lower third of the columns on the walls of some temples in Asia Minor, as for example, in Aizani and in Ancyra.

The thickness of the walls is to their height usually from 1 to 11.5 to 1 to 13 (see Nike Apteros, Aizani, etc.); these walls therefore require less material and possess less stability, than Doric walls of equally careful construction.

172. Subdivision of Surfaces of Walls.

The decoration of the wall surfaces internally and externally by pilasters is permitted, as proved by the walls of the Temples at Miletus and those of the Propyleion at Priene.

240 The angles are specially accented by small projections, frequently of unequal width on the different sides (see Temple of Nike); the slightly projecting wall ends or antae, described in the Doric style, likewise occur here and are opposite the external or intermediate columns, or they increase to become massive piers, as on the north portico of the Erectheion and on the charming caryatid portico in Athens.

173. Doors and Windows.

3. Doors and windows exhibit openings of vertical rectangular or trapezoidal shape. The sides of the former either consist of plain vertical piers, which like antae are crowned by capitals and are connected at top by a plain lintel (Fig. 161), as for the doorway of the Caryatid Portico, or richly moulded jambs and lintel enclose the opening, as at the doorway of the north portico of the Erectheiona A broad band, decorated by flat rosettes similar to those usually occurring on Assyrian tombs[212], is the principal member of the casing of the last doorway, and it is recessed toward the opening in moulded ogee bands ornamented by leaves. The rosettes on the bands of the jambs have instead of the low calices deeply drilled holes, that may have served for fastening a movable ornament. It is

singular to find in the midst of the exquisite and marvellously executed sculpture the setting bosses remaining below the second rosette of the left jamb. On the right and left of the lintel project from the wall magnificently wrought volute-consoles, models in design and execution, and they receive the cap, which consists of cornice, carved lower member (egg-and-dart mouldingU and the cyma ornamented by anthemions; these parts compose in construction, in form and proportions, one of the most beautiful doorway enclosures of all times (Fig.162).

Note 212. See Dieulafoy, Vol. 2, p.31.-- Already at Mycenae was the doorway to the recently more carefully explored second "Tholos" similarly enclosed. See Ephem.Arch.1891.Pl.1.

A similar treatment is also found on one of the Ionic rock-cut facades of tombs in Telmissos; Instructive there is the false bronze or wooden door with its architrave, panels, knobs and nails, imitated in stone.

221 Another rock-cut tomb in Antiphellos shows the architrave of the door with the strongly marked, so-called "ears", with an ogee moulding extending around it and three bands, a treatment that we meet with again on the windows of the western side of the Erechtheion, in simplified and ennobled form.

It is worthy of note, that in all the cases mentioned, the mouldings are carried down to the base or sill and are not returned or extended horizontally.

The window sills on the Erechtheion are simple and plain, shaped like a rectangular plinth in section, furnished with a groove and a hole for inserting a plate for closing it, and which may well have been of perforated or thin polished marble, like what may now be seen in old Italian churches (S. Miniato and Orvieto).

174. Columns.

4. The column consists of the base, shaft, and capital, and it is not inclined toward the wall of the temple, as in the Doric order, but is set strictly vertical. It is diminished[221] less than the Doric column, has a scarcely measurable entasis, rising in slender form like its wooden prototype to a height of 8 to 10 times its lower diameter. Including plinth, the lower diameter of the column is to its height as follows:-

Temple of Athena in Priene.	1 to 8 1/3.
Propyleion in Priene.	1 to 9 1/3.
Temple of Apollo in Miletus.	1 to 9 1/5.
Propyleion in Athens.	1 to 9 1/6.
Temple of Apollo in Phigaleia.	1 to 9 1/2.
Temple of Zeus in Aizani.	1 to 10.

242 The height of the base (exclusive of the plinth) is less than or equal to the lower radius of the column; the height of the simple capital (measured from above the volutes) is somewhat more than that radius; if a necking ornamented by anthemions is arranged, as on the Erectheion, then the height of the capital (measured from the top of the abacus to the bottom of the astragal) is about 3/4 the lower diameter, or is equal thereto, as on the Temple in Phigaleia.

Twenty-four flutes of semicircular or oval horizontal section, separated from each other by narrow fillets, surround the shaft of the column and terminate in semicircular form at top and bottom, passing into the apophyges.

On the older monuments, the base consists of a slightly concave block of circular form, fluted horizontally or decorated by astragals and scotias, and which rests directly on the uppermost step of the stylobate and supports a torus likewise fluted, from which a small round with fillet and apophyge forms the transition to the shaft of the column (See Samos and Priene). The bases of some temples have only the lower half of the torus fluted (see Priene), while the upper half is left smooth in the circular form. This expresses no diversity in the mouldings, for such a base is merely not entirely finished; to avoid any injury to the delicate fillets, their working was deferred till the entire completion of the building, and then frequently lack of means occurred, or they were intentionally omitted, since mouldings on these exposed places were scarcely to be insured against injuries. Color might easily restore the harmony, i.e., painted flutes might replace sculptured ones. The lower half must be entirely wrought before setting, since it was practically impossible afterwards to get at it with tools, while the later working of the upper half presented no difficulties of any kind. Many of these bases were then set on square plinths,

especially those in Asia Minor, as in Aphrodisias, Aizani, Teos, Priene (Propyleion), and thus removed from contact with the stylobate. The Frence excavations undertaken in Miletus some years since yielded even polygonal plinths, ornamented by reliefs and placed beneath the bases of the columns(Fig.163).

The bases in the interior of the Temple at Phigaleia are of more expanded form with a strong apophyge; a beautifully perfected and refined form is shown by those of the Attic monuments on the Acropolis of Athens. Without plinths, if the circular socle of the Ionic columns of the Propyleion in Athens be not so considered, they stand directly on the stylobate and are composed of a large torus, fillet, scotia, fillet, a smaller tor-
247 us with fillet and an apophyge. The toruses are partly formed like a group of small astragals, are fluted like the columns but here horizontally,[213] or are covered by interwoven ornamentation (Fig. 163).

Note 213. On the Erectheion, the bands of the intermediate columns of the north portico are bordered, but are sunken on the antae and the angle columns.

Corresponding to the more luxuriant forms of the architecture of Asia Minor, the bases at Miletus have the torus covered by overlaid scales or foliage, or they are decorated by scroll and anthemion ornaments.

175. Capital.

Wherever in Asiatic wooden architecture the straight wooden beam occurs with the isolated support, the column, an abacus is interposed[214], that is variously ornamented, for example on the Tombs of the Persian Kings[215], like the figures of bulls projecting on two sides and which support on their backs a projecting transverse beam. A transitional form between a corbel and a detached support is not interposed, but the columns terminate directly under their loads.

Note 214. See Dieulafoy. Vol. II. pp.46, 47.

Note 215. See the same, p.31.

Other terminal forms with corbels are shown by a rock-cut
245 tomb at Limyra;[216] both ends are formed as volutes in the preferred archaic Assyrian spiral shape (Fig. 164).

Note 216. See Petersen and von Luschan.

As the decoration of a capital, the spiral form is found on Assyrian relief slabs, Phoenician stone structures, Cypriote steles, ivory pieces from Nineveh, ancient Persian columns, and of wooden chests, exactly like the corbels of Limyra in meaning, as shown on ancient half-timbered houses of our time, as in Fig. 165, taken from a wooden house of the 17 th century in Mauach on the Bodensee, (Lake Constance).

226. Hittorf and Viollet-le-Duc[217] indeed stated these facts long ago in their explanations of the Ionic capital and accept the carved, or carved and painted, abacus as its primitive motive. its form is translated into stone with reference to the properties of the material, thus avoiding too great projections sidewise, and becomes the columnar capital, especially if a suitable ending be added to the top of the shaft.

Note 217. See Hittorf. Recueil des monuments de Segeste et de Selinunte. Paris. 1870. pp.266 - 834 and pl. 82. -- Puchstein, O. in 47 th Program for the Winkelmannsfeste of the Archaeol.Gesellsch. in Berlin. Berlin. 1887. No. 21.--Bohrmann in Jahrb.d.Kais. Deutsch. Arch. Inst. Vol. 2, p.273 - 285. Berlin. 1889. -- Antike Denkmäler, published by Kais. Deutsch. Arch. Inst. Vol. 1, pls. 18, GI. Berlin. 1888. -- Lastly, Koldewey, pl. 16.

This supposition obtained increased probability by the peculiar capitals published by Hittorf[218]; it has become a certainty during recent years from the finds on Lesbos, in the Troad, and especially on the Acropolis of Athens. According to the latter, we should regard the Ionic capital as being composed of two parts; of the crowning annular mouldings of the shaft of the column, and of the undercut abacus with the characteristic endings mentioned. The artistically perfected combination of these two parts and their union was the problem, that Grecian architects eventually knew how to solve in such a marvellous way.

Note 218. In Restitution du Temple d'Empedocle a Selinonte ou l'Architecture polychrome chez les Grecs. Paris. 1851.Pls.3,4.

176. Earliest Types of Capitals.

a). Just as in Persian buildings, there is wanting in the earlier Grecian volute capitals any transition from volutes to

column; the lower base of the former rests directly on the latter. On the capital, the lines of the volutes were not yet expressed by sculpture; they were either merely scratched in or painted in colors and were but loosely connected with the outline of the capital.(Fig. 166).

b). Another type is found on Lesbos and in the Troad, which seeks a combination of capital and column by means of certain scallops. The circular upper end of the shaft is continued in the capital and is carved in expanded form with the abacus coiled upwards, so that the volutes are already sculptured. (Fig. 166). The form of the capital is strongly oblong in form, and the abacus being the same thickness as the shaft, these permit an archaic wooden form to be recognized without difficulty.

c). A third, and the latest of the ancient types, shows the shaft crowned by a recurved ogee moulding, recalling the crown of a mushroom, on this being laid or imposed the oblong abacus, this projecting so far as the inventor judged the combination of the two forms to be sufficient for his purpose. (Fig. 167).

247 It is but a step from this last type to the developed Ionic capital of Mnesicles, even if various fanciful forms were possible between the two, that chiefly concern the form of the ending of the shaft and soon appear as a band, torus, Lesbian cyma, or as a combination of the two, until this finally clearly becomes the Doric cyma.

177. Attic Ionic Capital.

The capital of the perfected Attic Ionic style, when used on a peripteral structure, chiefly retains the same form, that was found over the rock-cut tombs in Antiphellos. As in the base below, the column likewise expands in the capital above and generally terminates in a projecting round with a small fillet beneath, and frequently with a second above it. This astragal is in most cases wrought in the same block with the shaft or the uppermost drum of the column, and there rests upon it the volute capital, also wrought from a single block, whose spirals descend towards the middle of the column; this downward direction personifies the "spring-like movement of

the curve". Beneath the depression of the volutes, but not touching it, lies a quarter-round projecting beyond the face of the spirals, ornamented by carved or painted egg-shaped leaves.

Above the capital is a rectangular abacus, profiled like the echinus, either left in plain form or decorated by leaves. Upon this slab rests the architrave. Surfaces are raised 1/25 inch above the astragal and also above the abacus to prevent breaking off the delicate projections in setting the heavier parts)See Propyleion in Athens and Fig. 168).

On most buildings in Asia Minor (which certainly belong to
248 a later period), the beautiful elastic lines connecting the two volutes together disappear and give place to a straight and dry connection (Fig. 166). The sides parallel to the architrave exhibit entirely similar forms; those at right angles thereto are again similar to each other, but are different from the front surface, cushion-like, contracted toward the middle, calyx or bell forms, decorated by astragals and hollows.

For a richer treatment of the capital, as at the Erectheion, there is also added a special necking member ornamented by vertical anthemion ornament, and above the quarter-round is a round decorated by interwoven work; the latter is then wrought on the capital, while the quarter-round with the necking on the uppermost drum of the column consists of a separate block.

But the anthemion on the necking of the capital is likewise appears on the fragments of the temples in Naukratis, on Samos, and in very recent years on the columns of the Temple in Lokri. While this is on the Erectheion separated from the flutes of the shaft of the column by an astragal, we find in the latter a contraction between flutes and anthemions, since the downward points of the foliage lie in the spandrels of the arches terminating the flutes(Fig. 169).[219]

Note 219. From Mitt.d.Kais. Deutsch. Arch. Inst. Röm. Abth. Rome. 1890. pp.192, 193.

The spirals move in delicately curved lines in several coils, that cannot be described by compasses, and end in the so-called eyes. The outlines of the spirals are bordered by an outward-

outwardly curved border, single or double (see Propyleion, Erectheion) and their surfaces are correspondingly hollowed out once or twice. In the richly shaped capitals, the turns of the volutes are separated by rectangular grooves or are joined with the spiral borders by delicate rounds.

178. Treatment of the Angle.

The vacant triangular space, produced at the points where the spirals separate from the depressed middle portion, is usually concealed by a small palmetto ornament; where this is not the case, as on the magnificent capitalss of the Erectheion, bronze nails in the outlines of the volutes indicate that gilded bronze palm leaves were inserted therein (Fig. 170).

179. Eyes of the Volutes.

The eye of the volute is treated as a strongly projecting rosette decorated by leaves, or its place is merely marked by a rudely wrought hole, indicating that a metallic ornament was fixed there, as shown by marks on the Erectheion, on the Temple of Cybele in Sardes, and on the Artemesion in Ephesus.

249. 180. Band joining Volutes.

The downward curve at the centre does not in all cases remain without ornament; remains in Attica exhibit an interruption at the middle with an upward curvature of the sunken border of the spiral, from which spring scrolls and palm ornaments (Fig.171). On the Temple of Cybele in Sardis,[220] the band is ornamented by a rose, from which scroll ornaments extend to the right and left (Fig. 175).

Note 220. See Durm. Ionische Kapitelle aus Kleinasien. Zeit. f.Bauw. 1876. p.565. pl.69.

181. Bolster.

The bolster at the side either retains its plain cut or bell shape, similarly enlarged from the centre toward right and left, or hollows and astragals, smooth or set with beads, ornament it, following the curve of the outer spiral, or merely the centre is masked by an ornament (see Miletus), or the surface of the bolster is covwred by scrolls and palm ornaments (see Priene and Sardes), or the bolster is composed of two acanthus cups united at the middle, from which reed-like leaves extend to the outer spiral margin and border it like lace, as may be seen on a single capital found on the Acropolis of Athens.

A capital found near Ephesus,[220] that exhibits spirals and egg-and-dart mouldings wrought with extraordinary beauty, has at the sides the heads of bulls looking outward from the bolsters, which were moreover not intended to support a load, just as was the case with its prototypes in inner Asia. (Fig. 175).

Note 220. See Durm. Indische Kapitelle aus Kleinasien. Zeit. z. Bauw. 1876. p. 565; pl. 69.

182. Angle Capital.

However perfected the Ionic capital must be termed, when employed between antae or in the line of direction of the architrave, it was just as unsatisfactory at the angle of the peripteral arrangement, where the two architraves are at a right angle.

The front surfaces of the volutes parallel to the architrave
250 are bent outwards at 45° on one half to avoid being spoiled; the inner volutes but partially appear as far as the eyes and intersect each other at right angles in an ugly manner, while the baluster sides are left tolerably complete in the original shape. The abacus must follow this amalgamated form of the capital, since its rectangular shape is dropped and it receives on the external angle an outwardly curved, cut off point, and on the internal one a small reentering angle. (Figs. 172, 173).

What makes the Doric capital so convenient for the peripteral arrangement, its uniform and ready usability in every place,
251 was wanting to the Ionic after its development, and even the Hellenic genius, skilled in forms, could not create any satisfactory result in the development of a special angle capital.

It is worthy of note, that on the Ionic capitals of the best period, the angle palm leaves of the volutes are placed in the triangular space above the cymatium, as on the ancient stele capitals, while they are later dropped on the cymatium. (See Sardes, Priene, Halicarnassus, Pergamon, Didymaeon, Teos, and the Ptolemaion on Samothrace).

A rather foreign treatment is shown by the Ionic capitals from Soluntum in the Museum at Palermo, on which instead of the angle palm leaves, tall upright anthemions are arranged as if intersecting the capital. (Fig. 174).

A more convenient peripteral use led (in the late period) to Ionic capitals with volutes on four sides, examples of which are given by Fig. 174. We find them common in Pompeii with polychromatic finish and with the characteristic eggs-and-darts on the low cyma, as if in thin metal. The volutes are then colored light blue on the front surfaces and yellow on the rear side.[221]

Note 221. See Damiani-Almeyda. G. Institutions Architectoniques et ornamentales sur l'Antique et sur le Vraie. Pl. 10. Palermo. 1884.

252. 183. Painting.

Even if the Ionic capital was already of richer design in form than the Doric, this richness was yet enhanced by the sculptured ornamentation, that covered all its members and attained the highest degree of its decoration by the painting of the latter. (See the plate opposite printed in colors).

Vestiges of this are well preserved in many cases on Athenian capitals and on separate capitals, whose use remains unknown. We should conceive the marble to remain unpainted or to be colored by the transparent, light yellow local tone, the egg-and-dart mouldings of the abacus and of the cymatium to be gilded, together with the beads, the borders of the volutes executed in deep red and gold, the bands separating the volutes being a rich blue, on which ground the gilded bronze ornaments laid thereon were sharply raised, and the nails at the intersection of the gilded interwoven bands on the round appeared in shining colored enamels. The gilded anthemion ornament of the necking rose from a red ground; the bases also exhibited similar colored ornamentation.[222]

Note 222. See coincident reports on the painting in Allg. Bauz. 1881. p.350.

On one of the ancient Athenian stele capitals, the volute lines are green, the eyes of the volutes are red, the cymatium is painted with red and green leaves; on another, the spiral lines are reddish-yellow, the eyes are purple, and the bands and palm leaves are red and white; on a third, the fret on the abacus is green on a red band, the eyes are green, and the leaves are alternately red and green.

Hittorf[223] colors the volute lines of the archaic volute cap-
253 ital red, the eyes and palm leaves alternately blue and red;
254 on another, the spiral lines are likewise red, the cymatium has blue and green bordered leaves on a brownish-red ground, the abacus fillet is green, and the volute eyes have yellow rosettes on a blue ground. Hittorf's statements agree with a drawing of the same capital made in the year 1839 by Hochstetter(in the Collection of original drawings of the Bauschule at Carlsruhe.

Note 223. See the same work and place.

Le Bas colors it in a scarcely probable way, making the spiral lines blackish-brown, the volute eyes red in one case, yellow in another, and the leaves light blue and white on the light yellow local tone of the capital.

Another peculiarity on the Ionic capitals of the Athenian propyleion remains for consideration; only the front egg-shaped leaves between the volutes are sculptured, while those beneath the balusters in deep shadow are merely wrought in outline and lack their completion in relief.(see Fig. 168). We scarcely have to do here with something "unfinished", but w with a well known "so far and no further", since the apparently incomplete leaves too plainly show the vestiges of former coloring in the border around them. It was probably believed that in this place, hard to reach with the chisel, the necessary effect could be produced by color.

But these capitals also exhibit iron pins inserted over the free portion of the cymatium, which were indeed intended for fixing external ornamentation, just like the small iron cramps on the balusters of the capitals of the Erectheion.

184. Columnae Caelatae.

Besides the simple fluted shafts of columns, there also occurred others on the Artemesion in Ephesus decorated by sculptured figures.(Fig. 175).

Figures of life size in strong relief surrounded the shaft above the base; an astragal separated the lower portion from the flutes. These columnae caelatae were represented on Ephe-
255 sian coins of the imperial period; after ten years of toil, fragments of them have been brought to light at the place it-

itself, which is due to the Englishman Wood. The magnificent remains of the figures on the columns are exhibited in the British Museum in London (see the shaft of a column drawn after these in Fig. 175); at the place and site, nothing was left, except the great trench, a few drums of columns and unimportant fragments.

A commencing point for the arrangement of such figure decoration of pillars executed in relief was afforded before the finds in Ephesus by the support of a throne of Zeus, drawn in Fig. 175, and which is preserved in the Museum at Palermo.

To the columns of the later Artemesion have also been added the fragments of the earlier Temple, dating from the era of Croesus, that are exhibited in the British Museum, and which show how these earlier art periods treated the columnae caelatae (Fig. 176). Not all the shafts in this Temple exhibit the figure decoration, for the flutes on some extend entirely to the base. Of great interest are likewise the fragments of capitals, from which their form may be determined with tolerable certainty. The volutes show similar profiles, as on the Temples of Messa and Lokri, while small astragals separate the convex surfaces of the volutes from each other; the volutes project strongly sidewise, while the eye falls far outside the extended line of the shaft. No less important are the fragments of the cyma; obliquely inclined slabs were bordered above and beneath by projecting rounds and decorated by lions' heads, between which were arranged small figures.[224]

Note 224. See Murray, A. S. Remains of archaic Temple of Artemis at Ephesus. Jour. of Hell. Stud. Vol. 10. (1889). p. 1-10; Figs. 1-5.

185. Construction.

The columns of the different temples were sometimes monolithic, sometimes composed of separate drums, just as the peculiarities of the material required. Thus for example, the columns in Aizani were marble monoliths 27.95 ft. high; but those in Miletus were on the contrary composed of 15 drums; those in Priene and Sardes were likewise constructed of separate drums. As on the Doric columns, the flutes were only cut after the columns were set, as proved by the shafts of the columns in Sardes

256 and on an incomplete column on the Temple of Apollo in Miletus. On the former, the guides and endings of the flutes are already wrought below the cymatium on the same block with the capital.

We find the same precautions on the bed surfaces of the drums, as were employed for Doric columns; only for very slender columns is iron frequently employed as a means of fastening them, as for example, on the remains of the western wall of the Erectheion, overthrown by a hurricane some decades since, and which was decorated by three-quarter columns, and also to be still seen on the prostrate drums of the Temple of Cybele in Sardes. The iron pins were there immovably fixed in lead in the lower bed of the block to be set, then being lowered into the corresponding holes in the upper bed of the block previously set, and the melted lead was then introduced through a small channel in order to fix this part (Fig. 177).

Besides this method, Koldewey[225] gives another mode of introducing the lead for fixing, by which the upper block was drilled through and the fluid lead was introduced through the hole. Similar pouring holes passing vertically and obliquely through the ashlars are also given by Bohn[226] for the Temple of Athena in Pergamon. That in this case, if the necessary space were provided, the fluid lead would more certainly reach its intended place, than by the horizontal channel, is self-evident; but tamping the lead then becam impossible, although it could be done on one side in case of a horizontal pouring channel; yet this tamping is of the greatest importance to the stability of the connection. Therefore the latter method is less secure and good, and on account of its complexity is indeed the earlier one.

Note 225. See his work, p. 57.

Note 226. See his work, p. 21, 22, and pl. VIII, 2.

186. Spacing the Columns.

The spacing of the columns no longer depends upon the frieze, as in the Doric order; they stand at uniform intervals and the intercolumniations, measured from centre to centre, do not at all exceed those of that architectural style. The lengths of the architrave have dimensions similar to those of the order

257 previously described; they run from 5.18 ft. to 7.22, 11.91,

and even 17.32 ft., while we have found in Doric structures lengths of 8.53 ft., 12.46, 14.63, and even of 17.81 ft.(Fig. 178).

187. Antae Capitals.

As in the Doric order, the antae and pilasters corresponding to the columns have capitals of a form different from that of the columns. The volute motive of the latter is not transferred to them, since the face of the wall required no bolster, but cymatiums and astragals, richly ornamented by egg-and-dart mouldings, heart-leaves, beads and disks, form a beautifully developed termination of the vertical and undiminished antae, which rest below on a base, moulded like that of the columns.

The treatment of the cymatium bands with leaf ornament at the angles is interesting, both on the antae and on the volute capitals.

The care employed in the execution of even the smallest detail is shown by this leaf ornament. Frequently concealed and used at a considerable height on the building, the details are yet worked out with the same love and care, as if they were placed directly before the eye of the observer; nowhere is to be found any carelessness in the modelling. How delicately felt
258 and graduated in relief are the different parts of the leaves, how unusually beautiful are the delicately curved outlines of the oval and acute leaves; how well studied and beautifully arranged is likewise the foliage on the reentrant angle of the abacus of the corner volute capital (Figs. 173, 179, 180). And with all this minute execution and surpassing treatment of the smallest details, the view of the general effect of the whole was not obscured.

188. Piers.

5). Piers and Caryatids. -- Besides the columns, rectangular piers and piers with faces like half columns (Phigaleia) were likewise employed as free supports, as on the Propyleion of Priene (Fig. 181), where they supported the beams of the porticos. These stand on bases moulded like those of the columns, and like columns, they are diminished from base to capital, that exhibits unique treatment of the volutes, which reappear in allied form on the pilaster capitals of the Temple of

Apollo in Miletus.

A third kind of detached support is the human figures supporting an architrave. We have already become acquainted with them attached to the wall of the cella of the mighttiest Doric monument, the Temple of Zeus in Akragas; as gigantic atlantes or telamones, they supported with arms thrown back the entablature of the middle aisle. Detached from the space-enclosing walls and bearing the architrave and cornice of a graceful portico, we again meet with them as isolated maidens in the Ionic style of architecture.

189. Caryatids.

These maidens (called caryatids) stand quietly and strongly on square plinths without especial animation in expression and attitude, the resting leg bent but slightly, the arms held close to the body, with carefully parted hair and hanging plaited tresses, a cushion upon the head, from which rises a cap imitated from the Doric capital.

Four such figures stand along the front of the Caryatid Portico at Athens in pairs similar in attitude and movement, symmetrically arranged about the axis of the building, the supporting leg on the outside with the folds of its coverings falling straight down, the leg at rest being on the side next the middle of the structure.

An Amazon from Thyrea once served a similar purpose, has her garments tucked up high, leans against a narrow pier and stands on a pedestal, with a Corinthian capital on her head, and is now in the Central Museum in Athens; in the same place are the remains of other free supports, that exhibit a strong, muscular and male upper part of the body, which ends below in smooth Hermes form. The monuments on which these finely wrought figures were employed are still unknown to me.[227]

Note 227. See Sybel, von. Katalog der Sculpturen von Athen. No. 442.

The three well executed pier-statues with serpent bases from the So-called Stoa of the Giants in Athens must likewise have
259 been utilized to support an architrave. In reference to the architrave supporting the colossal figures of the Temple of Zeus in Akragas, see Fig. 139.

Placed in front of the bearing support and only decoratively employed, like Egyptian prototypes, we find the human figure again on the so-called Incantada in Salonichi. The separation of the human form from its ohnamental connection and its elevation to an active part of the construction, to be a free statical member, is here repeated with perhaps a more correct feeling.(Fig. 182).

If the figures are actually supports, then in accordance w with the thinner and more elegant supports (they break easily at the weaker necking, as shown by the figures on the Erechtheion), the entablature is made lighter. Hence for example, the frieze is wanting on the building mentioned; instead of it, the upper band of the architrave is ornamented by rosettes in order to produce a richer effect or to compensate in some degree for the impoverishment of the entablature, due to the omission of the frieze. The internal supporting beams elsewhere corresponding to the frieze are omitted; the room is ceiled in the simplest manner by slabs with coffers. Dieulafoy recognizes in the arrangement of the entablature, the direct transference of the ancient Persian terraced roof cornice into stone.

190. Architrave or Epistyle.

6. The Architrave is made lighter than that of the Doric order, in accordance with the slender columns,; instead of the taenia with the suspended regulas with drops, they receive a continuous crowning moulding, often richly ornamented; its vertical surface is divided into two or three fascias and is generally subdivided alike, both internally and externally. The separate fascias may have once possessed painted ornaments, but vestiges of these are no longer visible. On the smaller monuments, they are cut from a single block of stone in width; in temples of important dimensions, where the diameter of the columns is increased to 6.56 ft. on more, they are made of two stone beams in width, as in Magnesia, for example.

Remains in Priene show the inner vertical surface of the architrave less in depth than the outer one, and the under surface is decorated by a sunken panel, bordered by a pearl band and heart leaves.(Fig. 183).

The height of the architrave is usually equal to the upper diameter of the column; it is frequently higher on the earlier

temples and also somewhat lower in the later ones. Thus for example, the architrave is higher on the little Temple of Nike Apteros, is equal on the Erectheion, and is lower on the Temples in Priene and in Miletus, than the upper diameter of the column.

As shown for Doric monuments, the contact of the bearing
261 surfaces is only on narrow cut borders. The architrave, cut from a single block, joins at considerably less than 45° for a space on the inside, then continues at right angles to the exterior.

In this order, it has also the purpose of receiving the beams of the portico, which rest directly upon it' this succession and jointing carries with it an alliance with wooden construction.

191. Ceiling Beams and Ceiling.

7). The Ceiling Beams are sometimes placed with regard to the location of the columns, without the addition of side beams, so that the centres of beams and columns coincide, and another rests on the middle of the architrave block, extending from one column to another, as on the north portico of the Erectheion, or they are placed entirely independent of the colonnade with added side beams, as for Doric marble beam ceilings, and which is also the case for the little Temple of Nike Apteros in Athens.(Fig. 184).

The ceiling beams are of rectangular section, are dressed smooth on the bottom and sides, and on rich monuments, they are crowned at top by a cymatium, pearl bead, with a narrow band beneath these, or merely by an echinus moulding in simpler monuments.

They are used for a span of 21.32 ft. on the Erectheion and receive the ceiling slabs, which there consist of large pieces with rich coffers, and which are cut away on the upper surface in accordance with form of the coffers in order to lessen the weight of the slabs.

The coffers were triply recessed and on their panels were fixed metallic ornaments, gilded bronze rosettes, as proved by the peculiar arrangements and by through holes.(Fig. 185).

Eggs-and-darts were richly painted and gilded on the echinus mouldings; the bands between the coffers were ornamented by

carved pearl beads, between which were painted red frets on a
bluish ground.)See Colored Plate opposite page 252).

On the little Temple of Nike, the spaces between the beams
were fitted with thin perfcrated slabs with covering slabs,
as on the Doric Temple of Theseus. But the coffer slabs do not
lie on the echinus mouldings, but on a specially devised bear-
ing on the body of the beam; the carved mouldings were 1/16 in.
below this, so that the delicate projections should be untouch-
ed during the setting and should also receive no pressure aft-
erwards.

Between the beams were inserted half beams of the same sect-
ion, resting on the architrave, whose projections were mitered,
then fitted together at right angles, thus completing the fram-
es of the ceiling panels.(This construction is still preserved
on the Temple of Nike and on the north portico of the Erechthe-
ion). The beams extend about half-way across the architrave,
262 but do not show on the facade; the ends of the beams and the
blocks between them are covered by smooth slabs like a frieze,
which are either left plain externally or receive figure decor-
ation, and appear as a separate architectural member above the
architrave, the frieze upon which rest the protecting covering
slabs of the main cornice.(Fig.185).

If the frieze is omitted on the exterior, and only the arch-
itrawe and cornice compose the entablature above the free col-
umns, the ceiling beams supporting the slabs likewise disapp-
ear in the interior and give place to a simple ceiling of cof-
fered slabs, as shown, like the one still preserved on the Carya-
tid Portico.

192. Frieze.

8). The Frieze (Zoophoros, figure-bearer, thrinkos)is req-
uired by Vitruvius to be about one-fourth smaller than the ar-
chitrave; "but if reliefs are to be executed thereon, about
one-fourth higher, so that the sculptures may appear better".
263 Vitruvius' rule approximately agrees with the plain friezes of
the buildings in Priene; the friezes are there one-fourth and
two-fifths less than the architrave. But the scluptured friez-
es of the Temple of Nike and of the Erectheion are likewise
lower than the respective architraves by about one-twelfth;
the rule does not appear to agree with these.

The small figures of the frieze are either carved on the slab, thus being of the same piece with it, or they are wrought separately and attached, as on the Erectheion, while the frieze slabs are of darker Eleusinian marble and the figures are made of Parian marble and were fixed by iron pins.

THe addition of color also increased the effect here. With this development, there is naturally nothing said of any influence of the frieze upon the arrangement of the columns.

193. Main Cornice.

9). The main cornice on most Attic monuments consists of a bold and moderately projecting inclined slab crowned by an echinus moulding and deeply undercut beneath, concealing an ogee with pearl bead, which passes into the surface of the frieze (Fig. 186).

The front surface of the cornice is usually inclined somewhat outwards, so that the lowest point lies nearer the plane of the frieze than the upper one, an arrangement likewise found in the covering bands of the small Doric members, as forexample, on the abacus of the column and antae capitals and on the front surface of the cornice slab.

194. Optical Rules.

Vitruvius requires for Ionic columnar structures:-- "all members above capitals of columns, especially the architrave, frieze, cornice, tympanum, pediments and acroterias, must have their faces inclined outwards about one-twelfth their height, because if we stand before them and two lines are drawn from the eye, one touching the lowest and the other the highest part of the building, the latter one to the upper part would be longest. Thus the more the line of sight to the upper part is elongated, the more this gives to it an appearance as if inclined backwards. But if the members of the facade are inclined forward in the mannar just prescribed, they will they appear vertical when viewed, and according to the measure of the angle".

264. (III, 5, 13). The fascias of the architrave are also actually inclined forward, as well as the front surfaces of the cornice slab; I cannot answer for the forward inclination of the other structural parts mentioned by Vitruvius, which are unfortunately no longer in position on any Ionic monument, or even no longer exist.

What an appearance, for example, would the pediment in Miletus have made, if with a height of about 19.68 ft., it had overhung about 1.64 ft? The refined feeling and eyes of the Greeks must have once required in Doric buildings a pyramidal diminution of all parts of a temple for well undestcood optical reasons, while for the frequently contemporary Ionic buildings, often standing in the immediate vicinity of Doric monuments, the opposite w.s prescribed.

Of what use is all the good researches on optical deceptions and the rules deduced therefrom, in the presence of such opposed facts! In the Ionic style everything is practically rejected, which in the Doric is prescribed as the highest perfection, as the most refined observance of all means for deceiving the eye! We here have the consistently carried out backward inclination of the columns, walls, architrave, frieze, and the pediment, there the exactly vertical position of columns and walls, the forward inclination of the front surfaces of the architrave and cornice.

Vitruvius requires a forward inclination, so that the parts of the building may appear vertical to the observer; we generally prescribe a backward inclination, in order that the vertical may not seem to overhang! The measurements are moreover small in this case, as for example:--

Overhang of the fascias on architrave of Erectheion	1/27 in.
Overhang of face of cornice there,	1 5/16 in.
For Doric members.	
Overhang of abacus of ante on Parthenon.	1 7/8 in.
Overhang of cornice above cella wall and frieze,	2 5/8 in.
Overhang of face of main cornice of Propyleion,	3 ins.
Overhang of face of cornice on Pinacothek,	2 1/4 in.
Overhang of abacus of capital on same,	1 1/2 in.

The overhang of these members may frequently be ascribed to the fact, they received ornamentation, and that this was better presented to the eye in this way. But this application of ornament is not always the case; others are so high from the ground, or one is compelled to view them from so near a point of view, (as for example, the cornice placed over the frieze of the Parthenon), that such a slight forward inclination of those parts

must remain without special effect.

195. Dentils.

But the simple undercut cornice gives place to a richer treatment of the main cornice, especially in monuments in Asia Minor, where the so-called dentils are inserted between it and the frieze. We find them employed on Attic buildings, only on the Caryatid Porch in Athens.

They vividly recall a motive borrowed from wooden construction, the projecting small ceiling beams, that were first cut in stone on the rock-cut tombs in Lycia.

On a monument in Priene, they project from a vertical surface and thus appear as if suspended, while on other monuments, like the Caryatid Portico, they more properly and elegantly seem to rest on the lower projecting member and then express the function of support. We likewise find the dentils at the angle of the building arranged in accordance with this idea (Fig. 187). We indeed find on some buildings the angles left solid, which may result from the not quite perfect completion of this portion of the cornice. The projecting angle appears to have been cut only after the setting of the cornice.

The dentils are usually crowned by a kind of head band, recalling a piece laid on the ceiling beams, upon which directly rests the undercut cornice slab.

196. Pediment and Pediment Cornice.

10). Pediment and Pediment Cornice. Low pediments crowned the ends of the temple, and like those of the Doric order, these must have been intended to receive groups of figures.

The monuments no longer yield any data concerning this, yet we know from Pausanias, that the externally Ionic Temple of Athena Alea in Tegea, built by Scopas, possessed sculptures in the tympanums representing the Calydonian Hunt[228] in one and the Combat of Telephos and Achilles in the other.

Note 228. Adler believes "that the external architecture was treated in the Doric style" and that only the cella had the "Ionic arrangement". See Cent.d.Bauw. 1888. p.98.

The pediment was covered by a main cornice like that of the horizontal entablature, if the latter were without dentils. But if these existed, they were omitted on the pediment cornice,

like the mutules on the Doric order.

197. Cyma, Acroterias, and Roof.

Both the horizontal and the pediment cornices are crowned by an ogee moulding, the cyma, which was decorated by vertical anthemion ornaments and by lions' heads along the sides.(Fig.188)

The cyma on the Caryatid Portico consists of a continuous quarter-round ornamented by egg-shaped leaves, as on the Propyleion, and terminated above by a small ogee moulding with leaves.

The angles and apex of the pediment were also crowned by ornamental acroterias or small figures, as on Doric temples.(See the Nereid Monument at Xanthus and the angles of the Ionic Temple at Pergamon.).

The construction and covering of a roof was indeed the same as that previously described, and we show in Fig. 189 the arrangement according to Choisy, as deduced from the building accounts.[229]

Note 229. See Etudes Epigraphiques sur l'Architecture Grecque. 8 me Etude; l'(Erectheion d'apres les pieces originales de la comptabilites des travaux.Paris. 1884. Also, Michaelis, A. Mitth. d. Kais. Deutsch.Inst. Athen Abth. Athens. 1889. p. 349 - 366. Lastly, Kirchhoff. Corp. Inscript.A. H. IV. 3.(1891).p.148-152.

c. Monuments.[230]

198. Monuments.

1. Rock-cut Tombs in Lycia. Examples at Telmissos, in Antiphellos and in Myra. (See Fig. 154).

2. The Nereid Tomb at Xanthus in Lycia. A tetrastyle peripteral structure on a high stylobate, columns short and widely spaced with heavy Ionic bases and clumsy capitals, strongly diminished shafts with entasis, the entablature without frieze, instead of which is an architrave decorated by figures, as in Assos.

Note 230. The later works in Asia Minor, that afford no data for determining the date of erection, but which were still mostly the work of Greek architects, even if the country had changed its masters in course of time, are here enumerated together with those monuments dating from the period of Grecian independence, or those belonging to the era of the Diadochides.

On does not hesitate to include the Olympeion in Athens with

the monuments of Grecian art, since it stands on Attic soil, although it was completed by a Roman architect.

268. 3. The Heroon (of Empedocles) in Selinus, a tetrastyle prostyle building. According to Hittorf, Ionic columns with Doric entablature and triglyph frieze (?). Material a yellowish limestone.

4. The monument of Theron at Akragas. A Doric entablature supported by four Ionic three-quarter columns (angle columns) on a high stylobate. The columns are strongly diminished, have Attic bases and capitals without bolsters, which are alike on all sides and have volutes curved outwards. Material a yellowish limestone.

5. The Heraion at Samos (already enumerated among Doric monuments, since it is assumed to have been built in a mixed style) was according to some a decastyle dipteral building, according to others, a pseudo-dipteral structure with wooden beam ceiling in panels. Several marble bases of columns are still preserved in their old places; others lie scattered around. The bases are archaic and heavy, with a fluted bolster below; the diameter of the column is 7.41 ft.; the capital shows a Doric echinus with a carved egg-and-dart moulding; but it should not be termed Doric for this reason; it may just as well be the lower half of an Ionic capital made in two pieces. (See Art. 123 and the section of the Erectheion capital in Fig. 173). The shaft without flutes still stands and serves as proof, that the Temple was never entirely completed. Moreover, it is the most ancient Ionic monument in stone.

6. The Temple of Nike Apteros on the Acropolis of Athens, a tetrastyle amphiprostyle structure on a white marble substructure of three steps. (Fig. 190).

The cella is built in small dimensions (12.40 × 13.74 ft) and is open on the eastern end; two narrow piers form the sides of the doorway; the side openings were closed by grilles, whose marks still remain. Similar grilles were on both sides of the eastern prostasis between the angle column and the antae. The internal walls appear to have had paintings; the painted ornaments of the architrave, antae capitals, cornice, and coffers, may still be recognized by their outlines, while the colors

can no longer be distinguished.

The columns are strongly diminished and have 24 flutes; the base is without plinth and the capital without necking. The entablature goes 3 1/2 times into the height of the column; the height of the architrave is less than the lower diameter of the column. The intercolumniation is 5.18 ft. The frieze is decorated by figures; the ceiling beams rest directly on the columns.

Spon and Wheeler saw the little Temple while in its original form; it was torn down by the Turks soon after the visit of these travelers. Its restoration was commenced in December, 1835 under the direction of Hansen, Ross, and Schaubert, and was completed in the following year.(Fig. 190). According to Wolters, Cimon was the builder of the "Nikepyrgos" (substructure), while the temple on the latter is later.[231]

Note 231. In Bonner's Studien. Aufsätze aus der Alterthumswissenschaft, dedicated to R. Kekule by his pupils. Berlin. 1890.

7. The Temple on the Ilissos near Athens was about equal to the latter in size; it was likewise a tetrastyle amphiprostyle building, only somewhat longer in proportion to its width.

The columns were a little stumpy, the bases archaic, the capitals of beautiful design, the bolster joining the volutes was gently curved downwards. The architrave was not subdivided into three parts; frieze and cornice were without ornament, and the entire entablature was somewhat heavy in proportion to the columns.

The little Temple was built of white marble, and it was very well preserved until Stuart's time, but was afterwards torn down; not a vestige of it can now be seen.

8. The Erectheion in Athens, the most beautiful and comparatively the best preserved monument of the Ionic style on the Acropolis of Athens, has on the east a hexastyle portico, on the west being 4 engaged half columns between angle pilasters with 3 windows in the middle intervals between the columns. This arrangement of half columns rests on a high substructure, so that the bases of the half columns are higher than those of the eastern portico. The design resulted from the peculiarities of the site. Not far from the western wall, there is on the northern side the magnificent doorway, and before this is a large

large porch with 4 columns in front and 2 on each side. These columns are taller than those of the eastern side. The southern side is on the same level with the eastern portico and has a separate projection, consisting of a high substructure on which 6 caryatids (4 in front) support an elegant entablature and a ceiling with coffers. The interior has not yet been sufficiently explained in all its parts, to which difficulty the obscurities in the description by Pausanias and the various additions of a later time have contributed not a little. Restorations of the building were published by Tetaz, Hansen, Bötticher, and Niemann. Julius also undertook one.[232]

Note 232. Baumeister. Vol. 1. p. 484 - 491.

269 270 Pausanias calls this white marble monument the Erechtheion, stating it to have been a double temple, in whose inner part was a spring of salt water, agatated during the blowing of the south wind, on whose rock floor might be seen the marks of a trident, signs made by Neptune to show that the country belonged to him. Here was also worshipped the most sacred image of Athena, that fell from heaven; here stood the golden lamp of Callimachos, which burned continuously for a year with a single filling of oil and a wick of "Carpasian" flax; the smoke escaped through a bronze palm trunk reaching to the ceiling. In the cella of Athena Polias was the consecrated gift of Cecrops, the wooden Hermes, scarcely visible for myrtle branches; articles from the booty of the Medes were also laid up there; the sacred olive tree, the evidence of the goddess for the country, put forth its branches in the Pandroseion. The Cecropion adjoined the western portion of the Temple, and the graceful Caryatid portico had its front towards the south.

Under the olive tree stood the Altar of Zeus Herkios. In the interior were various altars, where sacrifices were offered to Erectheios, to the hero Boutes, and to Hephaistos. The walls were decorated by paintings relating to the family of Butades. The colored ornamentation of the different architectural members has already been mentioned. The building shows two different times of erection, as discovered by Chandler and proved by an inscription tablet brought to England, on which are inscribed collections for the still unfinished portions of the Temple.

The recently discovered inscriptions are interesting, which were discovered by Ross in 1835 - 6 beneath the ruins of the great battery in separate pieces, since they contain accounts for the completion of the building and afford, in regard to the painting in particular, wages for sawyers, burners-in (encaustic painting), gilders, day laborers, sculptors, modellers, who furnished wax models, bronze-workers, who executed the coffer ornaments, superintendents, etc., are entered thereon; payments for the purchase of gold and of lead are recorded on them.[233]

Note 233. Details of these in Quast, A.von. Das Erectheion zu Athen. From the work of H. W. Inwood. Berlin. 1861-4. p.267; see Note 229; also, Pausanias, I, 26; lastly, Borrmann in Mitt-d.Kais. Deutsch. Arch. Inst. Athen Abth. Athens. 1881. p.372 etc.

The Temple is entirely built of white Pentelican marble, excepting the relief frieze of darker Eleusinian stone, as well as the sculpture of this frieze and the roof tiles, which were made of Parian marble. The foundations are built of poros stone; the roofs were made of wood, as proved by gains cut in some roof slabs. Tetaz assumes that the roof slabs did not here rest directly on the rafters, but on a strong sheathing of boards. The gutters had a painted ornament, whose preliminary outlining with the point is still recognizable. The proportions, mouldings, and treatment of details belong with the noblest, most beautiful, and richest in antique art.[234] See the colored Plate opposite page 252, as well as Figs. 180, 182, 185, 186, and 189.[235]

Note 234. The Caryatid Portico was in a ruined condition in consequence of Lord Elgin's robbery and of the explosion of a bomb, and it was restored in 1846 at the cost of Piscatory, then French ambassador in Athens, by the architect Paccard.

Note 235. Concerning the plan of the building, also see:-- Rangabe. Das Erectheion. Mitt. d. Kais. Deutsch. Arch. Inst. Ath. Abth. 1882. p 258, 321, Pl. 10; also Petersen, E. Zum Erechtheion. Same . 1885. pp.1-10. In reference to the doorway of the north portico, see:-- Meier-Schultz in Hellenic Studies, Vol. 12, (1891), pp.1-13, pls. 1-3.

9. The Ionic Hall of the Propyleion in Athens, consisting of 6 marble columns supporting the entablature, 3 in each row, connected by architraves bearing the ceiling beams and slabs.

The columns are slender, have a slight entasis, and including capital and base, are somewhat more than 9 lower diameters in height. The surface of the shaft shows 24 flutes, which end at top and bottom in semicircular form. The base is Attic and stands on a kind of circular plinth, wrought on the supporting ashlar; the upper torus is fluted horizontally. The nobly shaped capital has single volutes and borders of the same, also without a necking.

The height of the architrave equals the upper diameter of the column; it is divided in 3 fascias and is crowned by an echinus moulding.

The shafts are built of monolithic marble drums; only a few short fragments are now standing; the capitals partly lie in pieces on the ground. (See fig. 148, p.224; Fig. 168, p.247).

10. The interior of the Temple of Apollo in Phigaleia. Four piers at right angles thereto and one at 45° break each side of the internal wall of the cella. The piers end in half columns in front with the same thickness as the pier. They are slen-
271 der, moderately diminished, built of single blocks, and have a height of about 10 lower diameters; 11 flutes end above and below in horizontal form, surround the rounded portion, and lead in a bold apophyge to the enlarged and projecting dish-like base. The capital has no bolster, but is on three sides furnished with volutes curved outwards, on which a bold, slightly curved abacus rests in a peculiar manner. The architrave is smooth and has merely a crowning moulding with a narrow band beneath it. The animated and beautiful frieze with figures is about one-third higher than the architrave; a cornice above it is delicate and projects the same as its height. (See Fig. 191 and p. 225 under 7).

272 11. The Philippeion in Olympia was a circular building surrounded by columns, according to Pausanias, whose apex was formed by a bronze poppy-head, that held the beams together.

The German expedition describes[286] the circular portico as belonging to the Ionic order.

Note 286. See Ausgrabungen; Vol. 3, pl. 35; Funde, p.34, pl. 37; Footnote, p.17; lastly, p.70, 193, 196, of the same volume.

The restoration shows the Temple, or rather the Heroon, as a

circular peripteral building of 18 columns and with a diameter of 50.02 ft. Three marble steps formed the visible substructure, while the enclosing walls consisted of poros stone. The bases of the columns exhibit a simplified Attic- Ionic design in the mouldings; the echinus and the angle-flowers below the single channeled volutes of the capital are left smooth. The architrave is wrought from the same block with the frieze, and the cornice has dentils. The cyma was of marble, decorated by lions' heads and crowned by palm-shaped antefixes. The roof was covered by clay tiles, the portico was ceiled with stone slabs with trapezoidal coffers. The internal wall was divided by 12 Corinthian half columns. The ornamental forms were nearly all produced by painting, as well as the decorative details of the coffers. The colors themselves could no longer be determined.

12. The Temple of Athena Alea in Tegea excelled in beauty and extent all temples in the Peloponnessus, according to Pausanias. The order of columns in the interior was Ionic, while Doric columns must have surrounded the building.(See Art. 158, p. 231). The front tympanum was adorned by the previously mentioned Calydonian Hunt, and the rear one by the Combat of Telephos with Achilles. Besides the statue of Athena, the interior contained statues of Asklepios and of Hygeia by the builder of the Temple, Scopas from Paros. The teeth and skin of the Calydonian Boar were preserved here. Besides these scanty notices, only a few fragments exist for the determination of this famous building.

13. The Mausoleum in Halicarnassus, the Tomb of King Mausolus, who died in 354 B.C., has been tolerably well settled by Newton's excavations, in relation to its extent and its details. It was perhaps a work of the architect Pythios, the architect of the Temple of Athena in Priene.

On a high substructure stood a cella surrounded on four sides by Ionic columns. There were 9 columns on the facade and 11 on the side, and they are moderately slender, slightly diminished, and surrounded by 24 flutes. The base had a bold torus above two scotias connected by astragals. The volutes of the capitals are small, and there is no necking. The architrave is divided into three bands, the frieze is ornamented by figure reliefs, and

the cornice is enriched by dentils; the cyma was decorated by anthemion ornament and lions' heads. Above the cornice rose a marble pyramid of 24 steps, on whose platform stood the colossal statue of the king with the quadriga. Vestiges of color were likewise here discovered on some remains.

283 14. The Temple of Apollo Didymaeos in Miletus, made famous by its very ancient oracle, was burned by Darius, then perhaps restored, entirely destroyed by Xerxes, and again rebuilt after the war for freedom. The remains now preserved to us indicate the era of Alexander. The last Temple was built at the same time as the Temples of Ephesus and of Magnesia by the architects Daphnis of Miletus and Paeonios of Ephesus (the latter being the builder of the Artemesion in his native city); Vitruvius reckons this, with the Artemesion in Ephesus, the Temple of Demeter in Eleusis, and the Temple of Zeus in Olympia, as the four finest in antiquity. Strabo states concerning it, that it excelled all others in magnitude, and that on account of its great span, it remained without a roof. Pausanias simply mentions it as not completed.(Fig. 192).

It was still standing in the 5 th century A.D. and was probably destroyed by an earthquake.

The cella walls still exist in their entire extent to a height of about 9.84 ft.; the ashlars in part have setting bosses, were cut from great blocks of grayish marble, and merely form the facing of the walls 8.95 ft. in thickness, whose middle portion is built of rough stone. The walls were internally divided by pilaster projections, whose varied and original capitals belong to the most interesting finds. A frieze was arranged between these capitals, which was ornamented by griffins holding lyres.(Fig. 193).

The Temple was a dipteral structure with 10 × 21 columns and measured on the facade 159.28 ft. between centres of columns; (at angles ?); the intercolumniation was 17.32 ft. and the lower diameter of the shaft was 6.89 ft.

Three columns are still standing, two being connected by the architrave; one is not finished and is only roughly cut, verifying the statements of the ancient writers, but all capitals and the cornice have otherwise disappeared. To the bases pub-

published by Texier and others are to be added others with polygonal plinths and decorated (See Fig. 168, p.243), excavated later, as especially peculiar. The shaft is surrounded by 24 semicircular flutes extending beneath the cymatium: a necking is wanting. The volutes are beautifully curved and have the proper relative dimensions, but are connected together without an elastically curved bolster. The architrave is divided into but two bands and is decorated by an ornamented cove, ogee, and pearl bead at top. Exclusive of capital and base, the columns are each composed of 15 drums. The published restorations are problematical.

15. The Artemesion at Ephesus was the sole sanctuary of Ionia spared by Xerxes. After it was burned by Herostratos, it was rebuilt by the zealous participation of all the Greeks and according to the designs of the architect Deinocrates. Built in a marshy location, Samian mechanics effected the draining of the site "by means of skins of animals and charcoal" and made possible the erection of the structure on the prescribed place. The beneficent and pious feeling of the believers furnished certain parts, for example columns, in whose flutes were inscribed the name of the giver. The Temple, for which the neighboring marble quarry of Coressos supplied the materials, rose as a dipteral structure from a substructure of 10 steps in front. The columns were about 58 ft. high, and 36 of them had on the lower part of the shaft the sculptured figure ornament previously described, in the production of which Scopas was engaged, while Praxiteles adorned the great altar before the Temple with sculptures. The capitals exhibit a treatment allied to that if the Athenian Propyleion.

The Temple was plundered and destroyed in 262 A.D.; with the ruins, the Turks built in the 18 th century the Mosque of Selim, which is now likewise a ruin![237]

Note 237. According to Curtius, E. Ephesos. Berlin. 1874. pp. 34, 35.

204 In the spring of 1871, Wood succeeded in bringing to light some marble remains, sunk in mud 19.68 ft. deep. These prove the correctness of the fabulous dimensions of the parts of the Temple given by Texier and others, as for example, columns of

10.50 ft. diameter, or an intercolumniation of 29.52 ft.! Vitruvius also locates the invention of the Ionic style of architecture at Ephesus in the 7 th century B.C.! (Figs. 194, 195)[238]

Note 238. In reference to the older Artemesion, see p. 225 and Fig. 176, p.254.

16. The Temple of Artemis Leucophryne at Magnesia on the Meander was built of white marble by the architect Hermogenes. A pseudodipteral structure on a substructure of 5 steps, it exceeded in magnitude all temples in Asia, according to Strabo (XIV, 40, p.647), excepting those in Ephesus and Didyma; it even excelled those in beauty of proportions. It was completed and was nearly contemporary with the Temple at Priene, therefore being erected about 330 to 300 B.C. As on the Parthenon, the ashlars of the cella were connected by iron cramps, the bases of the columns were of Attic form, the torus ornamented by leaves; the shafts were fluted and were composed of 3 to 4 blocks; the architrave and frieze were constructed of two pieces in width. The cyma was decorated by lions' heads placed over and between the columns, and anthemion ornaments were sculptured between them. The portico was connected with the cella by wooden architraves (ceiling beams ?). No figure ornamentation was arranged in the tympanum. The terra cotta remains found near the Temple are of interest, are covered by a vermilion-red glaze, and are surrounded by a band with running ornament in black.

The Temple was surrounded by a wall built of great ashlars with bosses, which adjoined the walls of the city. Rectangular defensive towers were placed at certain distances; Doric colonnades of great simplicity extended along the inside of the walls, whose surfaces were ornamented by monochrome painting.

Especially notable is the magnificent frieze representing the Combat of the Amazons, of which about 656 ft. in length altogether **were** found, as well as other portions recently by Villefosse, Humann, and Kern. About one-third of this is in the Museum of the Louvre.[239] Further extensive excavations have recently been made at this Temple at the cost of the Archaeological Institute in Athens and of the Museum in Berlin, which show that the plan of the entire building is still tolerably well

preserved. Almost all pieces of the columns and of the entablature lie around the Temple, so that the entire superstructure may be restored in drawings. Its importance for the history of art consists in the fact, that it was the first pseudodipteral building, as stated by Vitruvius. (III, 2, 8). The excavations have verified Vitruvius' description. Three building epochs may easily be distinguished in this building; a), the ancient dipteral structure with Ionic columns of poros stone, that have 32 flutes (5 th century ?); b), the pseudodipteral building of white marble erected by Hermogenes, likewise in the Ionic style (3 d century ?); c), a Roman rebuilding, when the cella wall was furnished with a sculptured frieze with scrolls, and the Temple court was enclosed by porticos and an encircling wall.[240]

Note 239. Photographic representations of this are in:-- Revue Archaeol. 1887. p.257. Also, see Rayet and Thomas, Milet et le Golfe Latmique. Excavations and Explorations made at the cost of Barons S. and E. de Rothschild and published under the auspices of the Ministry of Public Instruction and Fine Arts. Paris. 1887.

Note 240. See Mitt. d. Kais. Deutsch. Arch. Inst. Athen. Abt. Vol. 16, part 2. Athens. 1891. p.264, 265.

17. The Temple of Dionysos at Teos, an Ionic hexastyle building, also eustyle, probably after its destruction by Xerxes rebuilt by Hermogenes from Alabanda in Caria, who concurred with Archesios and Pythios in declaring the Doric order to be unsatisfactory for the Temple, according to Vitruvius.

The considerable ruins consist of a confused heap of overthrown blocks of marble, utilized by the Turks for tombstones and for burning into lime.

Of the base, the plinth, lower torus, the scotia and its fillets, were wrought in one piece, while the upper torus with the fillet and apophyge were cut on the shaft of the column. The fragment of a lion's head and a portion of an ornament are the sole remains of the main cornice yet found.[241]

Note 241. New drawings of this temple are to be found in Antiquities of Ionia. vol. 4 (1882). Also see Rayet and Thomas.

18. The Temple of Athena Polias at Priene was a peripteral structure of 6 × 11 columns, built 340 B.C. by Pythios. The ba-

The bases are composed of two marble blocks and rest on plinths; the fluted shafts of the columns consist of several drums; the capital is without a necking and has beautifully treated volutes, connected by a gently depressed bolster; the eyes of the volutes are drilled 1 1/4 inches deep, and they were therefore intended to receive metallic ornaments, like the capitals at Ephesus.

The architrave was divided into three bands and crowned at top by a cove, cymatium and a pearl bead; the frieze is about 2/3 lower and remains smooth; the main cornice has dentils and cymas ornamented by lions' heads and scroll ornaments.

The upper half of the torus on the bases is left smooth (unfinished), while the lower half is fluted; the dentils at an angle likewise remain unfinished. (See Fig. 163, p.243; Fig. 187, p.264). The ruins of this Temple lie in a confused heap with those of the appertaining:--

19. Propyleions, which originated at a later date than the Temple. Their interiors are divided in three aisles by two rows of pilasters, whose capitals recall those of the pilasters at Miletus (Fig. 196). The pilasters have the same bases on plinths as the columns: the shafts of the former are diminished from base to capital. The enclosing walls are divided internally and externally by pilasters. Tetrastyle porticos adorn each end of the buildings; the bases of their columns standing on square plinths.

The shaft is moderately diminished, consists of a single drum, surrounded by 24 flutes and about 9 1/3 times as high as the lower diameter. The volutes are not very large and are connected by a straight band; the bolster is covered by free scroll ornaments. (See Fig. 171).

The architrave is externally divided into three bands, but internally into but two and is lower there, and has a sunken panel on its under side; the frieze is unusually low, the main cornice has dentils.

20. The Temple of Cybele in Sardes, so-called by Prokesch and Braun, referring to Herodotus (V, 102). Destroyed by fire and earthquake, 6 marble columns were still standing in 1750,
276 3 at the beginning of the next century, and but 2 at this time, half covered by earth. Whatever cut stones belonging to the

walls, entablature, and columns, lie on the ground or are still concealed by it, are carried away for building purposes, according to the needs of the inhabitants and of Europeans, who build railways.

The Temple likewise belonged with the largest of antiquity, since the shafts of its columns show diameters averaging 6.56 ft.; these indeed had a height of 58.04 ft., and thus were approximately equal to those of the Artemesion in Ephesus. They were built of roughly cut drums of unequal sizes, with a hole at the centre, carefully polished toward the exterior, and connected together by iron dowells set crosswise. The flutes are started on the capital blocks; a rose springs from a light scroll ornament between the volutes; scales and upright palm-leaves cover the bolster. The eyes of the volutes have holes for the reception of metallic ornaments.(See Fig.175).

21. The Temple of Aphrodite in Aphrodisias was a pseudodipteral building of 8 × 15 columns on a substructure of three steps, and was pseudotripteral at one end. Its dimensions on the lowest step of the stylobate are 72.16 × 160.72 ft.

The columns stood on plinths; the architrave was divided in three bands; the frieze was smooth, and the cornice had dentils. The style of the monument is of such purity, that it can be placed on a level with the most beautiful in antiquity. Some of the columns were given by the citizens, who inserted their names and the motive of the gift on a tablet fixed on the column. The rectangular temple precinct was enclosed by a wall, which was subdivided by coupled Corinthian columns, alternately supporting segmental and angular pediments, interrupted by niches.

22. The Temple of Zeus in Aizani (Aizanoi) in Phrygia, scarcely mentioned by ancient writers, was entirely unknown until 1825. An English traveler brought the first news of the existence of these magnificent marble ruins, which certainly date from the end of the Asiatic monarchy or the beginning of Roman supremacy. Inscriptions from the 2 d century B.C. were found there and permit the inference of a later date: but there is too much that is beautiful in the architecture, for this to be accepted with certainty. The Temple was a peripteral structure of 8 × 15 columns on a substructure with 7 steps in front; the

intercolumniation was 8.30 ft.. and the distance of the columns from the wall of the cella was 15.28 ft.; the dimensions on the stylobate were 121.03 × 71.83 ft. The monolittic marble columns had diameters of 3.18 and 2.86 ft. for a height of 27.97 ft.; the height of the capital was 1.21 ft. and that of the base (including plinth) was 2.10 ft.

The volutes are rather small and are connected by a straight band. In a peculiar way, small vases occupy the upper endings of the flutes. The capitals of the columns between the antae have cup-like members decorated by acanthuses beneath the volutes; the antae capitals have similar ornamentation. The walls of the cella are decorated below by frieze bands, and are crowned at top by a rich foliage frieze. The architrave is divided into three bands, which are connected by pearl beads, and it is decorated at top by a richly carved egg-and-dart moulding and palm-leaves; the architrave is on the inside lower, simpler, and divided into but two bands. The frieze has vertical piped ornament; the cornice has dentils with small modillions over them. Beneath the cella is a semicircularly vaulted room 52.48 × 29.52 ft., accessible by a stairway, that may have served for preservation of the treasuresof the Temple.

The Temple terrace is also of importance, is for the most part preserved, and it measured 480.19 × 534.31 ft. It was broken at one side by a flight of projecting steps 98.4 ft. wide, on the right and left of this being decorated by 22 arcades, whose former facing with marble slabs is now settled. Gardens, exedras, statues and stoas, were planned and built in the Temple precinct, which was enclosed by a wall.

23. An allied treatment of details, especially on the capitals, which accord tolerably with those between antae in Aizanoi, is shown by the colonnade on the scene of the Theatre in Laodiceia.

24. Finally, the little portico of a Bath in Cnidos is to be mentioned, with its pretty columns-in-antis, as well as the following remains of monuments.

25. Two Ionic votive Columns near Mylasa.

26. Ruins of a Temple of Notion near Colophon.[242]

Note 242. See Schuchardt; Mitt. d.Kais. Deutsch.Arch. Inst. Athen. Abth. Vol. II. Athens. 1886. pp.421, 422.

27. Ruins of the principal Temple of Pessinus in Galatia.

28. Temple of the Napean (?) Apollo on Lobos, whose remains were removed and built into later structures. The very archaic volute capitals are of the highest interest for the history of art(see Art. 176; Fig. 166, p.245), five of which were built into the old Church of Taxiarchis. The spiral lines are likewise here drawn with a free hand and their radius of curvature does not diminish uniformly. The capitals exhibit a great similarity to the capital from Neandria published by Clarke.[243] (See Art. 176).

Note 243. In Amer. Jour. of Archaeol. 1885.

The shafts of trachyte that have been found, 23 in number, have diameters of 1.64 to 2.33 ft. The bases belonging to them consist of a great torus of segmental form and a smaller astragal above it with the apophyge of the shaft.[244]

Note 244. See Koldewey. Die Antiken Baureste der Insel Lesbos. Berlin. 1890. p.44-46; pls.16, 17.

29. The Temple in Messa on Lesbos. Only the foundations now remain on the old site and these consist of four enclosing walls and two longitudinal and transverse walls extending between them. The material is black trachyte-tufa. According to further discoveries, it may be assumed that the Temple was a pseudo-dipteral structure of 8 × 14 columns, that stood on a substructure of 3 steps and consisted of cella, pronaos, and opisthodome.

The palm leaves of the angles of the volutes lie on the cyma; the volute eyes have a square inset in the circle. The fascias of the architrave are separated by pearl beads; the under surface is sunken, this panel being enclosed by a pearl bead. The cornice is of beautiful proportions and exhibits dentils, the cyma on the geison is ornamented by scroll ornaments and lion's heads, the latter being perforated.[245]

Note 245. See same work, p.47-61; pls. 18-26.

30. The Temple of Roma and Augustus on the Acropolis of Athens. An Ionic monopteral structure of white marble stood on a stylobate of two steps, measuring 20.34 ft. from centre to centre of columns. The capitals of the columns are imitated from those of the Erectheion; the high architrave is divided in three bands, the frieze is plain, and the cornice is without

dentils.[246]

Note 246. See Antike Denkmäler, published by Kais. Deutsch. arch. Inst. Vol. 1. Berlin. 1891. p.25.

31. The Propyleion of Ptolemaios II on Samothrace. A double portico structure with 6 columns on each front, executed in coarse-grained Thasian white marble. The shaft of the column is surrounded by 24 flutes; the architrave is high and the low frieze is decorated by ox skulls and rosettes; the dentils above this are large in proportion to the cornice, the pediment cornice is thin and the pediment plain. The capitals have bolsters decorated by scroll ornament, as in Sardes.[247]

Note 247. See Hauser, Benndorf, and Niemann.

32. The so-called Old Temple on Samothrace, of which merely the foundation courses remain. The frieze was adorned by dancing female figures; the cornice had dentils, and the cyma was decorated by lions' heads and anthemions; the antefixas ended at the edge of the cyma with palm leaves. The relief frieze is in the Louvre.[248]

Note 248. See Conze, Hauser and Benndorf. Vol. 2.pls.8-10.

33. The Temple in Lokri. On the site of an earlier temple of an order no longer to be determined, stood the peripteral building with an elongated cella, pronaos and opisthodome, on a substructure of three steps, whose blocks were in a single external layer, but were doubled and clamped together at the angles. The surrounding portico had 6 × 17 columns, which were connected with the stylobate with dowells. The intercolumniations between axes differed on the ends and sides, the former being 10.4 and the latter 8.66 ft.

Pronaos, opisthodome, and also the porticos, had pavements of stone slabs laid on a grating of beams. No stone of the cella wall remains in place now, and only mere fragments of the columns are to be found. Their bases recall by their form those of the Heraion on Samos; the shaft is covered by shallow flutes ending in semicircular form, above which is a necking ornament of anthemions. While on the Erectheion, this is separated from the flutes by a pearl bead, we find in Lokri a connection of these with the anthemion, since their downward points lie in the spandrels of the arc. Above each fillet rises either a lotus or a

palm leaf, as shown by Fig. 169. The anthemions were painted, and the underside of the slab over the necking was red, while the ground was generally left white, the edges of the lotus flowers were colored red, as well as the points turned downward toward the fillets between the flutes, the palm leaves were entirely red, as well as merely the margin of the covering leaf, from which the palm leaf springs.[249]

Note 249. See also the anthemions of the capitals in Naucratis and from Samos in Antiquities of Ionia. Chap.V. pl.6: 1-3.

The capital shows a broken line in the volutes with a convex volute band, like a capital of the Heraion on Samos[250] and the recently discovered old Ionic capitals of Tschadri-dagh and of Messa (see Figs. 166, 197), then in the volute eye is a 6-leaved flower and on the surface of the bolster are vertically falling scales, whose upper surfaces are slightly hollowed between margin and rib. The abacus is plain in front, but on the sides are vestiges of an egg-and-dart moulding. Blue coloring was on the ground of the echinus and the sides of the pointed leaves.[251]

Note 250. See the last Chap. V; pl.6; 4-5.

Note 251. See Petersen in Mitt.d.Kais. Deutsch.Arch.Inst. Athen Abth. Vol. 5. Athens. 1890. p.176-201, also Antike Denkmäler, published by Kais. Deutsch. Arch. Inst. Vol. 1. Berlin. 1891. Pls.51; p.40-42; lastly, Fig. 189. p.248.

34. Concerning the Temple of the Ionic order in Naucratis, Gardner published some remarkable details[252]. This archaic temple, dedicated to Apollo, shows in its fragments of fluted and slightly diminished shaft, the Samian base of archaic character with a heavy round ornamented by scales and beads above the round endings of the flutes, above which, as in Phoenician capitals, is given a kind of echinus band with overlapping recurved leaves, on which the volute bolster must have rested. The upper portion will then will not be unlike the stele capital from the Athenian Acropolis.(See Fig. 167).

Note 252. See Naucratis. Part. 1. 1884-5. By W. M. Flinders-Petrie, with chapters by Smith, E.Gardner, and Barklay V. Head. Third Memoir of Egypt.Explor.Fund. London. 1886. Pls. 3,4; also Part 2 by Gardner with an Appendix by F.Ll.Griffith. Sixth Memoir of Egypt.Explor.Fund. London. 1888.

Other portions exhibit the necking ornamented by anthemions without a separating pearl bead and with the like arrangement of the flowers as on the Temple in Lokri.

The second Temple of Apollo there shows in its fragments the pearl bead and scale border beneath the anthemion.

35. Concerning the Ionil Temple on the Theatre Terrace in Pergamon, something is to be found in the following source[253].

Note 253. Bohn, R. Vorläufiger Bericht über die Ergebnisse der Ausgrabung zu Pergamon. Jahr.d.Preuss.Kunstsamml.Berlin. 1888. pp.43-8.

36. The Temple of Apollo Chresterios in Aegae was built of brownish trachyte and lay on a slightly elevated terrace. Before this are the remains of a great flight of steps leading to the Temple, which are preserved. The Temple probably had - columns on the facade, of relatively good workmanship. These had a height of about 24.6 ft. for a lower diameter of 2.72 ft.; the mouldings of the base are Attic, and the capital is without necking. The architrave is divided in three bands, the frieze is lower than that, is ornamented by ox skulls and garlands, and the cornice has dentils, not rectangular, but curved in the form on an echinus moulding. The dedicatory inscription indicates the year 48 B.C.[254]

Note 254. See Bohn and Schuchardt in Alterthümer in Aegae. II Ergänzungsheft d. Jahrb.d.Kais.Deutsch.Arch. Inst. Berlin. 1889. p.46-9; Figs.57-67.

37. The Temple in Neandria on the Tichigri-Dag, where Clarke found the peculiar Ionic capital illustrated in Fig.166, was regularly excavated by Koldewey. It consists of a substructure 42.21 × 84.33 ft., on which stood the cella without external columns, enclosing a room 26.24 × 65.01 ft., which was divided into two longitudinal aisles of equal width by a central row of 7 columns. The foundation was placed on the solid rock and is composed of two courses of irregular stones, separated from the regular masonry by an interposed course of stertchers .66 ft. thick. But the foundations of the columns are of granite blocks, while the columns themselves are of Liparite. The floor of the cella was 1.25 ft. below the threshold of the doorway; one must therefore have descended into the Temple. Access to

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the cella was afforded by a doorway 4.17 ft. wide, whose threshold was at the same height as the external pavement. From the fragments discovered, Koldewey succeeded in determining the form of the interior, the ceiling, and the columns supporting the roof, which especially recalled Persian columns. (Fig.198). The capitals are composed of a series of leaves, cymatium, and volutes, and crown the plain and strongly diminished shafts without bases, whose lower diameter is 1.74 ft. and upper one is 1.31 ft. The capitals are not alike and also do not show the same treatment of the front and rear faces. The former must therefore have been turned towards the entrance, since they exhibit the more perfected style. The capital with ascending volutes above a cymatium ornamented by leaves is then established in three places, in Kolumdada, Aegae, and Neandria, and it is to be termed Aeolic-Ionic. The horizontal Ionic volute is then contrasted with the vertical Aeolic, 404 to which should be added a third form, the Cypriote intersecting volute (See Fig.166). According to these discoveries, the Aeolic type existed at the same time and independently of the archaic Ionic; "they are three branches from the same stem, of which the Aeolic bloomed earlier and withered". The capital from Boghaz-koi cited by Puchstein may be regarded as the parent of all.[256]

Note 256. Same work as before, p.58.

The ground plan shows the most intimate connection with the so-called Basilica in Paestum(See p. 204); the earlier Temple in Lokri must have had the same form, and we should recognize in this two-aisled plan perhaps the oldest form of temple.

The architrave, cornice, ceiling, and roof, were of wood. A main longitudinal beam was supported by the columns, and the transverse beams then rested on this and on the walls, even if the ceiling and roof did not coincide, when the columns supported the ridge-beam. The volutes were therefore placed at right angles to the longitudinal beam, just as on the Persian capital, the beam rested between the projecting bulls and not on them.

The covering of the roof consisted of flat red tiles, 1.74 × 2.76 ft. with hollow tiles to match, the lowest course having a

turned-up margin with peculiar water-spouts (Fig. 198). The ridge was covered by hollow tiles, which had a finial according to the fragments found, as on the Heraion in Olympia, while t the hollow tiles were closed on the edge of the gutter and showed sculptures on the closing surfaces.(Fig.198, E). A cyma ornamented by small figures extended along the pediment (Fig. 198, D), recalling the similar treatment on the older Artemesion in Ephesus.

38. Details of the so-called Tomb of Sardanapalus at Tarsus may be found in the source mentioned below.[257]

Note 257. Koldeuey. Aus der Anomia. Berlin.1890. p.178.

199. Closing Remark.

As an Ionic internally uncovered temple design, we have mentioned that at Miletus (Fig. 192) and have suggested the possibility of a small uncovered court in the peculiar ground plan of the Temple in Phigaleia' but the examples of Ionic so-called hypaethral temples are thereby exhausted, even if these are indeed to be regarded as such in the meaning of Vitruvius. The hypaethral arrangement is now in most recent years accepted for the temples of other orders, particularly on the evidence of Vitruvius and the discoveries at the Olympeion in Athens by Penrose, though strong dissent by Dorpfeld exists.[258]

Note 258. Mitt.d.Kais.Deutsch.Arch.Inst.Athen.Abth.Vol.16, heft.3. Berlin. 1891. pp.334-344.

Chap.3. The Corinthian Order.

a. Development.

200. General.

The Corinthian order does not appear with entirely characteristic forms, like the Doric and Ionic; it is rather based on
281 the two last styles of architecture, that earlier attained maturity and perfection. But "it is likewise archaic and prehistoric in its external characteristics".[259] The most distinctive characteristic, the column with the bell capital, already occurs in Thebes in Egypt on the splendid buildings of the 19 th dynasty (1447 to 1273 B.C.); but we likewise find it on Sculptures in Nineveh, as well as very ancient additions thereto in the Grottos on Thera, and again recalling the design of the

latter, on the great Temple outside Miletus in Ionia, also on ancient remains found on the southwest coast of Asia Minor and made known by Newton, on the Grecian mainland in the Temple of Apollo at Phigaleia[260], on the Asclepion at Epidauros and in other places.

Note 259. See Semper, Braun, Reber, etc.

Note 260. In regard to the building of this Temple, see Baumeister, Vol. 3.pp.1319, 1320.

201. Theory of Vitruvius.

Vitruvius states that the capital was invented by the sculptor Callimachus[261]; maker of the golden lamp in the Erectheion, who was busied as sculptur, architect, carver, and also as painter, and he relates the well known myth concerning it, of the nurse that placed a basket of flowers covered by a tile on the grave of her young mistress in Corinth, which was then surrounded by a sprouting acanthus plant, and it thus furnished the motive for the new form of capital to Callimachus passing by. He then made the Corinthian column after this model, which fixed the harmonious proportions and the principles of the building of structures of the Corinthian order.[262]

Note 261. Probably from Athens; lived about the 93 d Olympiad (464 B.C.

Note 262. See Vitruvius. IV. 9, 10.

In the fourth book, he further states, that the Corinthian order itself has no special rules for the cornice and the other decorations, "but either employs modillions on the main cornice from the arrangement of the triglyph members with drops on the entablature after the Doric style, or a frieze with dentils, adorned by reliefs, and a cornice according to Ionic principles".

Thus from the two orders, to which was added a new capital, a third order was created for the style.

202. Characteristics of the Order.

But this novelty in form did not merely consist in thes arrangement of the cornice, nor in the use of the Egyptian bell capital, and which was in the later period to supplant the other orders, but in the elastically poised frieze, that according to Semper, is treated "as a gently poised wave, which elasticall

receives the load of the frame of the ceiling and transmits it to the architrave".

203. Appearance and Extension.

In accordance with what has been said, the marks of the appearance and acceptance of the new style are found in those monuments, in which the different orders occur together, in the interiors of the Temples at Phigaleia and of Miletus, the Tholos in Epidauros and the Philippeion in Olympia, the Arsinoeion on Samothrace, the Temple of Athena Alea in Tegea, but only in the period of Alexander did it find general acceptance and become the prevailing order; after the complete destruction of the independence of the Grecian states and people, it was fostered and cultivated by their splendor-loving masters.

204. Remains.

The remains of this order left to us are scanty, both on Hel-
282 lenic (European) and likewise on Asiatic soil; but precious evidence of this most sumptuous architectural style are preserved for us in the graceful Choragic Monument of Lysicrates in Athens and in the Temple of Olympian Zeus, located on a high terrace in the lower city of Athens, a monument, that in magnitude and splendor, in beauty and massiveness of materials, seeks its equal in all ages, and whose construction continued for six and one-half centuries (it was finished 650 years after the laying of the foundation stone), although with interruptions, from the Pisastratides until Hadrian.

We wonder at the entrancing and delicately membered details on the one, the slender columns of scarcely .98 ft. in diameter, and on the other at the gigantic shafts of about 656 ft. diameter and nearly 55.76 ft height, as well as the marble beams of the architrave over 21.32 ft. long.

Exactly as in the Doric and Ionic styles of architecture, we here likewise find the same forms, sometimes on the most graceful little architectural structures, sometimes on the mightiest colossal temples.

205. Material and Polychromy.

The material employed on most Corinthian monuments in Greece and Asia Minor is white marble, whose fine crystalline grain is particularly suited for the skilful execution of the numerous

small sculptures and ornaments.

Polychromy generally becomes of less importance on the works of this style in comparison with the two others. Color decoration here chiefly gives place to relief ornament; the use of perishable colors must in time yield to the mode of natural ornamentation with colored stones, and thus to a monumental polychromy.

The gilding of certain parts may perhaps have been more commonly employed, than on the buildings of the Doric and Ionic orders.

b. Form and Construction of the Chief Parts.

206. Substructure.

1. The Substructure. The temples of this order likewise stand on a substructure of several steps, that is constructed of smooth blocks of stone in the manner already described; this is either the plain rectangular form of step, or that with a small rebate on the lower angle of the step, like those already found on the Doric Temple in Nemea.

On the upper corners of the steps of the Temple in Labranda, echinus mouldings are said to occur, but these were found in such a damaged condition, that their original form can no longer be determined with certainty, and they also give occasion for the conjecture, that they are merely the vestiges of the bosses for protecting the exposed angles, which had not been dressed off. (Fig. 199).

The only remains of larger temples of this style are those of the Olympeion in Athens, and those of the so-called Temple of Zeus in Labranda; the steps have entirely disappeared at the former and the substructure no longer remains in its original extent; only 13 columns at the southwest angle and 2 of the inner row on the south side still stand erect, a third having been overthrown by the storm of 1852. The steps of the other are now in great part concealed by rubbish and ruins, so that their number cannot even be determined. Under these circumstances, there can be no consideration of any "curvatures", or of their intentional or unintentional existence; the 4 + 3
283 columns in the front row on the south and east facades of the

Clympeion are no longer in condition to afford measurements to 1/25 inch.

207. Cella Walls.

2. Cella walls. Likewise but few remains of these exist, but which do not differ in form and structure from those previously described. In accordance with Ionic prototypes, the cella walls in Labranda rested on bases, which had the same profile as the bases of the columns and antae, and they were terminated at top by a special cap.

The walls were indeed absolutely vertical, in accordance with the oosition of the columns.

208. Doorways.

3. But few fragments of doorways are preserved. The finds in Labranda are 20.24 ft. high, exhibit rich mouldings, and like an architrave, are divided into three bands with pearl beads, echinus moulding and cove.(Fig. 200).

209. Columns.

4. The columns are divided into three parts, as in the Ionic order, for they consist of base, shaft, and capital; they are not inclined toward the cella wall, but are accurately vertical and are of slender proportions, like the Ionic with slight diminution and entasis.

The lower diameter of the column goes into its height (including base and capital) as follows:--

On Clympeion in Athens	8 4/5 times.
On Monument of Lysicrates	10 7/10
On Temple of Zeus in Labranda	9 1/2
On Temple of Claudius Caesar in Ephesus	10 1/2

The upper diameter is from 1/7 to 1/6 less than the lower. The base is usually the Attic Ionic on a square plinth; the mouldings are sometimes plain, sometimes decorated by interwoven bands,or laurel leaves then cover the torus. Including the plinth, it is equal to or rather higher than the lower diameter of the column.(Fig. 201).

After the Ionic system, 24 flutes surround the shaft of the
284 column, are separated from each other by fillets, and end in rounded form at top and bottom. In Labranda and elsewhere, a part of the scotia is occupied by a tablet, on which the name

of the benefactor at whose cost the columns were erected and finished, and whose meaning is, for example:--

"Leon Kointos, son of Leon, dedicates as Stephanophoros this column with its base and capital, as he promised."

On the Monument of Lysicrates, the flutes exceptionally end in the form of recurved leaves; a plain groove between these and the lower row of leaves on the bell of the capital was indeed originally filled by a metal band. An astragal, a round and fillet, the former decorated by beads on a column in Miletus, or treated as a band, as on the Olympeion, separates the shaft from the capital.

210. Capital.

"More refined and slenderer" than the Ionic, according to Vitruvius, for its height including the abacus, but without the astragal, is little greater than the lower diameter of the shaft of the column, the capital is chiefly characterized by its bell form.

The low and tense echinus of the Doric and Ionic capitals, that expands under the weight of the entablature, is here replaced by a high moulding, that like the frieze, receives the burden and transmits it to the shaft.

The Egyptian prototype, imitated from the corollas of native plants, first bore no relief ornament; a circle of broad pointed leaves surrounded the bell at its base on the shaft; behind these extended to its upper margin closely set lancet-shaped leaves.(Fig. 202).

We find the same arrangement on one kind of Corinthian capital, that on the Theatre of Dionysos and on the Tower of the Winds in Athens, as well as on buildings in Asia Minor (Pergamon). But the plant ornament ornament is different; the Greeks chose for ornaments the plants native to their country, instead of the Egyptian flora, preferring those species that could be used in relief and were typical. A circle of acanthus leaves with narrow sedge leaves springing from behind them, and all wrought in relief, composed the decoration. But neither for the Egyptian capital, nor for the Greek, was the load laid directly on the bell; a square slab was interposed between the bell or basket (calathos) and the architrave.

This abacus does not project beyond the edge of the bell in the former; in the second, it projects in accordance with Doric models, and is not shaped like a heavy slab without ornament, but as a delicately moulded and not very high (measuring about 1/6, or according to Vitruvius, about 1/7, the height of the capital) covering slab, whose sides abandon the straight line and in gently curved lines intersect sharply at the angles, or are there cut off.

285 286 The diagonal of this abacus sometimes equals twice the height of the capital, and sometimes is rather less. (Vitruvius requires in Fig. 203, that b c = 2 h, while on the Olympeion, the length b c is less than 2 h; he makes the rise of the arc = 1/9 b d, while in many cases it is considerably less).

The profile of the abacus is either an echinus moulding with fillet and cove, or an echinus moulding with fillet, cove, and another fillet. (See Monument of Lysicrates in Fig. 203).

The bands (astragals) of the square bell capital were merely painted, were in relief in the Ionic style, and are treated as rounds with fillet and apophyge, as shown.

211. Volutes.

Besides this simple painted decoration of the bell, there already occurs at an early date in Egyptian Thebes a second and richer ornamentation thereof, which combines relief with painted ornament. Four of the large leaves enclosing the bell extend up to its top and there curve downward like volutes (Fig. 203); the spaces produced between these leaves near the top of the bell are adorned with painted ascending forms. In a still tasteless manner, we find this arrangement of the ornamentation of the capital on the capital found in Phigaleia, though entirely changed into relief; merely the abacus here remains heavy and is painted in the archaic manner. (Fig. 202).

The volutes conceal in the most beautiful way the underside of the triangular corners of the abacus, projecting beyond the edge of the bell, and appear to support these projecting parts.

A freer treatment is shown by the capitals of the half columns from Miletus, which must be classed with the most beautiful of this order. Two rows of acanthus leaves, eight in each, are so arranged that the mid-ribs of the upper row fall in the

intervals of the lower one, and surround the bell for about 2/3 the height of the capital; behind these spring forth 8 volutes (helices), which meet in pairs beneath the angles of the abacus, while 4 palm leaves ornament the corresponding angles of the bell.

A similarly more perfect development appears in the capitals of the half columns of the Choragic Monument of Lysicrates (334 B.C.) in Athens. The movement of the leaves and of the helices is perhaps to be termed somewhat less fluent and affected in comparison with that of the capital from Miletus; (Fig. 202); the entire capital rather bears the stamp of a sculptor's experiment.

289 The capitals of the Olympeion in Athens exhibit the form, that became typical later, with two rows of acanthus leaves, the helices resting on them, and the flower rising above the abacus.

New light has been cast upon the history of the Corinthian capital by the finds at the Tholos in Epidauros, a work of the younger Polycleitos, who worked about the middle of the 4 th century.[263]

Note 263. See Robert, C. Archaeologische Märchen aus alter und neuer Zeit in Phil. Unters., pub. by Kiessling & F.v. Wilamowitz-Möllendorf. Heft. 10, p.198. "We know nothing whatever concerning the family relations of the younger Polycleitos. The tradition, that he was the pupil of Naukydes, is chronologically even possible, but is very doubtful. --- That he was the architect of the Theatre and of the Tholos of Epidauros appears probable from the architectural forms of both buildings." Also see Foucart. Edifice d'Epidaure. Bull.d.Corres. Hellen. Athens and Paris. 14 th year.(1890).p.592 -594: "Pausanias mentions as most remarkable the Theatre and the circular edifice, termed Tholos, both works of Polycleitos. It is known that there were two famous sculptors of that name; Polycleitos the elder, who flourished in the 5 th century, and Polycleitos the younger, who lived in the early part of the 4 th century. Brunn (Gesch. d.Griech.Künstler, I, 2 d edit., p.152, 162, Stuttgart, 1888-9) attributes them without hesitation to Polycleitos the elder. This opinion has been commonly expressed, but is not based on

any proof."

The stone-cutters' marks found on the ashlars of the Tholos show that the Tholos is of the 4 th and not of the 5 th century, and it is further stated concerning a fixed date:- "Hence the Tholos was built after the Temple of Asclepios. The latter was erected before the year 352, probably about 375, but one cannot go beyond that date. The construction of the Tholos was undertaken afterwards, perhaps immediately, perhaps some years later. In any case, it is the work of Polycleitos the younger, and not that of Polycleitos the elder, same as the Theatre".

Everyone will agree with the conclusions stated in Note 263 above, who has seen and carefully examined the architectural details of the Tholos. The forms have no relation to those of the 5 th century, and we see that the capital was first more widely accepted in the Greek mother-country in the second half of the 4 th century.(Epidauros, Tegea, Olympia, Samothrace; Figs. 204, 205).

288 The erroneous view expressed by Bötticher[264] was indeed caused by the doubtful statements of Brunn(see his work), that the Corinthian capital of the Tholos in Epidauros was about 100 years earlier than that of the Philippeion, and it is indeed to be considered as rejected.

Note 264. Cent.d.Bauw.1885.p.236.

After its precedence in Phigaleia (430 B.C.?), the capital indeed appears in a tasteless form still, but already much more importantly developed (350 B.C.) in Samothrace, and a few years later in Olympia and on Samothrece. Since Scopas is considered a contemporary of the younger Polycleitos, each combined the talents of a great architect and of a sculptor; then the capital on the Temple of Athena Alea in Tegea mentioned must have had the same date of origin as that in Epidauros.

Vitruvius requires for the lower part of the capital the same diameter as that of the upper end of the shaft, excluding the apophyge and the astragal.

The capital is treated alike on all four sides, whether the bell is decorated by volutes or not, and it again adopts the general relateons of the Doric capital, since it shows the same free suitability for peripteral designs. To this fact,

combined with its beautiful form, is indeed due its supremacy over all other forms of capital in later times, even until the present!

212. Polychromy.

Polychromy only participated in this sculptured work so far that the ground of the bell received a darker tone, bluish or reddish brown, while the leaves, volutes, and flowers were partially or entirely gilded.

213. Construction.

The columns are monolithic on the smaller monuments; on the larger, they are constructed of separate drums, like those of the other orders, and which are not always of equal height.
289 On the Olympeion in Athens, the shafts are composed of 14 drums of unequal size, the capital being made of two blocks in its height, while the round bases and the square plinths are cut from a single block.

Notwithstanding their considerable diameters, the drums are not set upon each other merely in the manner previously described, as on the Parthenon and other temples, but according to the Ionic model(see Erectheion and Temple of Cybele in Sardes) are connected by iron dowells for the same reason, the slenderness of the shafts of the columns. Sometimes two of these, or sometimes four, are set in a drum and are employed in the manner shown by Fig. 206; small pouring grooves for introducing the fluid lead again lead to the dowell holes.

214. Spacing the Columns.

The spacing of the columns is just as free and independent as in the Ionic order, the distances between the axes are all
290 equal to each other and have dimensions similar to those on Doric and Ionic temples.

The distances between axes of the colonnade on the Olympeion exceeds that of the middle passage of the Doric Propyleion in Athens by only about 2 1/4 ins. The spacing on the Temple in Labranda in Asia Minor is wider than on the Olympeion; on the former, the diameter of the column goes into the axial distance 3 times, and only 2.8 times on the latter.(Fig. 207).

215. Half Columns and Piers.

Besides the detached columns, half columns are also employed

in this order as in the Doric and Ionic, and which are either directly attached to the cella wall (see Choragic Monument of Lysicrates) or to rectangular piers, as on the Tomb at Mylassa, this combination producing a peculiar kind of isolated pillar.(Fig. 208).

Free square piers likewise occur on the same monuments together with these coupled half columns, and in the sepulchral chamber are plainly wrought blocks without capital and base, above which short corbel-like projecting stone beams, like the caps in wooden construction, form the transition to the stone ceiling beams. The piers at the angles of the superstructure, like the Ionic in Priene, are divided into three parts like the columns and diminish upwards like them. Capitals and bases are imitated from those of the half columns, the former with two rows of acanthus leaves laid on the bell, behind which are or spring forth elongated sedge-like leaves; the surface of the shaft is fluted as on the columns.

216. Antae and Pilasters.

The antae (front piers) as well as the pilasters (wall piers) are adopted in the Corinthian order, just as they are found on Doric and Ionic monuments (See Akragas, Priene, Miletus). We find them generally divided into three parts and that these members are treated as on the columns, so that the bases exhibit the same profiles, and the volute capital has been simply transformed from the round to the flat.

The shaft is plain, or a border with sunken panel occurs thereon as an innovation and is without ornament, unless the inscription engraved thereon in some cases may be so regarded. (See Hadrian's Gate, Monument of Philopappus in Athens, and Doorway in Mylassa).

291 As a beautiful example of an anta capital, whose form was derived from an adjacent column capital, may be taken that one still preserved in fragments, which belonged to the Propyleion in Eleusis. Winged lion-rams with lion's paws project above the circle of acanthus leaves beneath the angle of the capital and are joined together by beautifully entwined scroll ornament; the abacus is curved inward as on the capitals of columns, and it has a slight outward swell at the middle, which ends in

a slightly projecting block.(Figs.209.- 211).[265]

Note 265. See Die Propyläen des Appius Claudius Pulcher in Eleusis. From Drawings of J. Durm in Zeits.f.Bauw. 1876. p. 437 et seq.; Pl. 63. Also Michaelis.A. Das sogenannte Dreifusskapitell von Eleusis. Mitt.d.Kais.Deutsch.Arch.Inst. Athen. Abth. Vol. 14. Athens. 1889. p.9; lastly, Lenormant, F. Antiqquites d.Eleusis. Rev.Gen.d'Arch. 1868. p.101-8, pls.1-3..---"The Dilettanti found the two antae capitals very much mutilated. We (i.e.. Lenormant and his associates) have uncovered them anew, together with a well preserved capital of a column, which had escaped the English examination.---The lower part is ornamented by a row of acanthus leaves, from which spring at the angles the forms of winged chimeras with lion's paws and head, to which are added ram's horns.

The heads of animals are wanting in the capitals published by the English architects and they have been made griffins!"

It remains singular that Michaelis (see his work) always speaks of "griffins" in spite of these facts, and notwithstanding the publication referred to, in the Rev.Gen.d'Arch. and in the Zeits.f.Bauw.

According to the researches of Michaelis, Dörpfeld, and Kawerau, these capitals with their peculiar form of abacus did not serve for supporting votive gifts (see Michaelis, p.10), as for example, Bötticher maintained. Our deductions from Lenormand are therefore correct.

322. 217. Tripod Capitals.

Columns of this order, that were employed to support votive gifts, frequently experience a change in the form of the capital in accordance with the shapes of these offerings, as for example, in case of a tripod placed thereon, the abacus of the capital assumes a triangular, instead of a square form. The sides of the abacus were then similarly curved inward, and the acute angles were cut off.

On this idea is based the most beautiful of all tripod supports, the unfortunately much injured crowning marble finial of the Choragic Monument of Lysicrates with its series of waterleaf, acanthus, and of the most magnificent volute scroll ornament , that has even been created in art.

218. Acanthus.

The acanthus is sharply cut on all greek monuments, the entire leaf being always divided into separate symmetrically arranged parts, which consist of a group of 3, 4, or 5 or more delicate and pointed separate leaves, separated from each other by strongly projecting bands. The leaf extends upward in beautifully curved lines; its apex is gently recurved without thereby producing the effect of being broken or wilted; elastic and full of life, it closely adheres to the form of the bell.

The acanthus represented in Fig. 212 was drawn from a fragment found in Athens and illustrates the treatment of the different parts. A capital exhibited in the former Museum of the Theseion in Athens shows the whole leaf and is at the same time an example of the degree of "ossification", to which the magnificently inspired motive of the bell and volute capital could sink.(Fig. 213).

293. 219. Assyrian Bell Capital.

Since the Egyptian bell capital was in the beginning introduced as a basal motive for the Greek Corinthian, it should finally be mentioned, that the same likewise already occurs on Assyrian relief sculptures, although in a far more uncertain and indefinite form.(See the collection of Assyrian capitals by G. Rawlinson).

220. Architrave or Epistyle.

5. The architrave is imitated from the Ionic, has a crowning moulding like that, and its frint surface is subdivided twice or thrice, the lowest bands were then frequently small and unimportant in comparison with the upper one (See Labranda); the face turned toward the cella wall is frequently lower than the front side, and the under surface is generally decorated by a narrow sunken panel.

There is no ornamentation on the fascias; but for example, on the Choragic Monument of Lysicrates, these were ~~recessed~~ for the dedicatory inscription.

According to the magnitude of the monument, the beams are constructed of one, two, or three pieces in their width, and on some monuments, they consist of two or three blocks side

by side; their greatest known length is 21.49 ft.(See Olympeion in Athens and Fig. 214).

The jointing and connections of the ashlars were done in the same manner as in the orders already described; the inside beams are mitered at 45°, while the outer ones abut at right angles; the use of iron dowells and cramps set in lead was very extended.

294. 221. The Frieze.

6. As in the Ionic order, the frieze is plain or bears sculptures, but in either case is from 1/2 to 1/3 lower than the architrave.(See Olympeion, Monument of Lysicrates, Incantada in Salonichi, Labranda, Mylassa, Ephesus). But the plain flat form of the Ionic frieze is likewise abandoned, and the characteristic innovation is introduced instead, that consists of an elastically curved frieze, as already mentioned. It is at Labranda swelled in a convex line, while in Salonichi, Mylassa and Ephesus, the form of the bell of the capital is repeated. The curved frieze then generally remains plain or is merely decorated by plant ornament, though vertical so-called pipes ornament the frieze of the Incantada.(Fig. 215).

222. Main Cornice.

7. The main cornice is either taken unchanged from the Ionic order, is treated as a dentil cornice(see Monument of Lysicrates, Labranda, in Fig. 216), or there occurs here another
295 characteristic innovation, the addition of modillions between the dentils and the projecting cornice. These were moderately large horizontal projecting beam ends, as on the Olympeion, subdivided into two parts in height, surrounded at top by an echinus moulding, were plain brackets, as on the internal cornice of the Tower of Winds at Athens, or richly ornamented volute modillions, as on the Temple in Ephesus.(Fig. 215).

In many cases, all members of the main cornice, such as the projecting cornice, cyma and intermediate members, are covered over with sculptured ornaments, continuing and completing the richness of bases, capitals and frieze. The main cornice of the Choragic Monument of Lysicrates received a very effective crowning ornament in the series of arched and connected, closely set antefixas, placed on the upper edge of the projecting cornice

like a crown.

223. Pediment Cornice.

8. The pediment cornice. The inclined cornice of the pediment received the same members as the horizontal cornice, to judge from the portal pediments of the Tower of Winds in Athens, on which the dentils were likewise employed on the inclined pediment cornice in a way scarcely to be justified technically,[266] as well as from the most important monuments of the later period, on which the pediment is frequently preserved for us, while it is usually destroyed on similar Grecian monuments, and never remains in fragments.

Note 266. Vitruvius (Book 4, Chap. 2, 5) maintains that the "ancients" did not approve and therefore never introduced the use of ends of rafters or dentils on pediments, yet the Tower of Winds, built about 100 years before Vitruvius, is not exactly evidence of the accuracy of the statements of the Roman architect.

224. Tympanum.

9. The tympanum must have been distinguished by figure ornamentation, and its angles and apex by acroterias or figures, in accordance with the earlier motive of the Doric and Ionic orders.

225. Ceiling and Roof.

10. Although the monuments of this order belong to a later period, few data concerning the ceiling and roof remain, like those of the other orders, scarcely anything of them remaining for us. Merely the ceilings of small secular buildings still exist, of the Tower of Winds and of the Choragic Monument of Lysicrates.

c. Monuments.

226. Monuments.

1. The Temple of Apollo Epicurius in Phigaleia, built by Ictinus (430 B.C.), architect of the Parthenon, contained a single column of the Corinthian order in its interior before the cella with the sacred statue. (For the capital, see Fig. 201).

2. In the Temple of Apollo Didymaeius not far from Miletus, dating from the time of Alexander, were found half columns of the Corinthian order, that belong to the most beautiful examples of that order.

3. At the Temple of Athena Alea at Tegea, built by Scopas about the middle of the 4 th century, Corinthian columns stood in the pronaos. (Also see No. 8 under Art. 158).

4. The Philippeion in Olympia, built about 337 B.C., had in its interior Corinthian columns, according to Pausanias, and this was confirmed by the excavations.

5. The Olympeion in Athens was a decastyle (10 × 21) dipteral structure containing altogether 120 columns, and it occupied a very ancient sacred place, was begun on a high artificial terrace in the lower city of Athens by the Pisastratides 530 B.C., its foundations being completed by the architects Antistates, Callaischros, Antimachides, and Porinos., then abandoned on account of political disquiet and again taken in hand by King Antiochus IV 400 years later, who promised to bear the entire cost himself, and who had "the grand cella, the double colonnade around it, the entablature and the other ornamentation, executed by a Roman citizen, Cossutius, according to suitable proportions and with the greatest skill and highest understanding; but this work has a name, not merely in general, but even among the few greatest monuments". He counts it among the temples, "whose splendor and ingenious restoration aroused astonishment, even in the council of the gods". (See Vitruvius, Bk. 7, introd. 15, 16, 17. "A temple in the country, unfinished on account of its magnitude", according to Livy).

But even Antiochus did not see the Temple completed; Hadrian alone brought it to an end in 135 A.D., after Sulla had previously taken some of its columns to Rome. (86 B.C.).

The ground plan of the Temple is no longer to be made out with certainty. White Pentelican marble served as the building material; the retaining wall of the terrace was interrupted by buttresses, was about 2460 ft. in length (1/2 mile) and was built of stone from Piraeus (See Fig. 44). The shafts of the columns were approximately 55.76 ft. high, and the architrave blocks were 21.49 ft. long; 16 columns remain, partly with their architraves; 15 are still standing, one having fallen during a storm in 1852.[267]

Note 267. Later excavations by Penrose have uncovered a portion of the substructure built by the Pisastratides. See Bevier.B.

Papers of the American School at Athens. Vol. 1. p.185 et seq.

6. The choragic monument of Lysicrates in Athens is a small round structure of white marble, pseudodipteral with 6 half columns, on a square substructure about 13.12 ft. high and built of stone from Peiraeus, covered by a cap of bluish Eleusinian marble. The ashlars have a sunk border along the bed joints, while the vertical end joints are not so marked. The walls of the superstructure are composed of tall slabs and terminate in a frieze-band at the height of the capitals, ornamented by tripods in low relief. The frieze above the architrave is decorated in the most beautiful manner by a figure composition, representing the well-known myth of the transformation of the Tyrrhenian pirates into dolphins, who had seized Dionysos.

The roof is cut from a single block, its outer surface ornamented by leaf-ornament like scales, and crowned by the magnificent acanthus finial mentioned in Art. 217, intended to receive the metal tripod. Three beautifully curved scrolls corresponded to the feet of the tripod and extend from the finial outward on the surface of the roof. The inscription on the architrave states that Lysicrates with a chorus of boys won the victory.(335 B.C.).

Fig. 217 affords the desired information concerning the present condition of the monument.

7. The Tower of Winds in Athens, or more correctly, the Horologium of Andronikos Kyrrhestes frog Kyrrhos in Syria, was built about 100 B.C. of white Pentelican marble, and was intended to support a weather vane and to contain a sundial and water-clock. It is an octagonal building of moderate height about 22.96 ft. in internal diameter, on the northeast and northwest sides being porticor with pediments and 2 columns each, and having on the south a choir-like, semicircular projection. The eight sides of the building are turned toward the points of the compass, and on each side abowe the terminal band of the wall is sculptured a flying figure, which represents in work of very ordinary execution the wind corresponding to that side. The figures are each executed on several slabs, and their heads and wings intersect the architrave members in a very awkward way.

The apex of the roof was decorated by a triton, which was movable and indicated with a staff the wind then blowing.

The lines for the sundial still remain, cut below the reliefs. The cornice is stumpy and rude in form, and the cyma is ornamented on each side by 3 lions' heads. (Fig. 219).

A channel conducted the water from the spring Clepsydra to the circular projection, that contained the water reservoir. The vestiges of the water clock are still visible on the floor. Beside this monument are still standing arches made of ashlars, which were formerly regarded as belonging to an aqueduct to the little building, but which according to later researches belonged to a separate structure The arches are not built of voussoirs' the small span, and the marble of which they are constructed, quarried in great blocks, indeed permit the omission of the usual construction of the arch. They are cut from rectangular blocks of stone, yet not in a complete semicircule, with plain soffit and decorated by archivolts profiled like an architrave; a rosette adorns the spandrel, a motive that Bramante loved to use in the Renaissance. Above these arches were an architrave and cornice, portions of which still remain in place. 268

Note 268. On various pieces belonging to this, the remains of inscriptions have been found, which refer this building to the imperial period, soon after Augustus. See Dessau. Mitt.d.Kais. Deutsch. Arch. Inst. Athena Abth. Vol. 7. p.398-400. Athens.1882.

The piers are treated in a peculiar manner, for on the front surface and in accordance with the archivolt resting thereon, an ornamental subdivision is arranged at their centers. Here the sides are no longer parallel, but diverge; the separating portion is cut with a broken surface in order to make possible an intersection of the returned profile of the cap of the pier. (Fig. 220).

The interior is subdivided in its height by two richly profiled cornices (Fig. 218), a plain band course supporting the upper columns at the angles, and an architrave band above this; the ceiling is composed of 24 stone beams resting against a central block in the manner illustrated by Fig. 11. The columns and antae at the entrances have no bases; but the enclosing wall has one, consisting of apophyge, fillet, and torus. The antae

are not connected with the masonry, but are set against it; the capitals of the antae exhibit in their remains the same, or a form allied to that of the capitals of the columns, a row of acanthus leaves with sedge leaves extending from them to the top of the bell. The execution of both is rude in comparison with the similar capitals found at the Theatre of Dionysos. The shafts of the columns are fluted, but those of the antae are plain. Only a short portion of an anta still stands, as well as two portions of the shafts of columns extending to a man's height; the jambs of the doorways still remain, but the capitals, architrave, cornice, and pediments of the portals are entirely detached from the building and are in great part destroyed.

The walls are built in courses of marble slabs 1.67 ft. thick and of various heights, and are still in good preservation, with the exception of some cracks. The setting bosses left in the flutes of the columns have already been shown in Fig. 77. The architrave and frieze of the portals are bonded into the wall; the pediment merely abutted against it. How far iron was employed in this fixing can no longer be determined in the present condition of the monument. Two steps of the stylobate are still in place and to be seen; the third is covered by the soil.

8. The Monument of Philopappus on the Museion hill near Athens (between 114 and 116 A.D.), built of white Pentelican marble as the Tomb of the uncle of King Antiochus IV, the last King of Commagene, is merely mentioned by Pausanias in these words:-- "A monument was later erected to a certain Syrian here". (On Museion hill).

Built in the form of an exedra, the monument was in perfect condition in the 15 th century, if a drawing of Cyriacus is to be believed, while it today only remains in ruins.[269] The substructure is built of Piraeus stone without mortar, 5 courses being visible; on this rise in curved form the fragments of a boldly designed marble base, over which is a relief with figures, below that being Philopappus as Consul in a quadriga, etc., allied in design to the reliefs of the Arch of Titus in Rome. A cornice terminated this lower structure, above which 3 niches were arranged between 4 pilasters or piers; the middle semicir-

semicircular niche is still preserved, as well as the figure sitting therein, now headless, of Philopappus, son of Epiphanes. The niches on the right and left were rectangular at top, like windows; the former with the remains of figures therein is still preserved, but the third has entirely disappeared. Side piers flanked the semicircular niche, one of which, with an inscription and a good acanthus leaf, still remains, while merely the base of the other is yet preserved.

A part of a pier with plain front and base still stands beside the rectangular niche and supports courses of stones as well as a piece of the architrave, cut from the same block as the plain frieze, and also a short cornice slab extending deep into the masonry.[270]

Note 269. In the Barberini Library at Rome.-- Concerning this drawing, see remarks by Reisch in Mitt.d.Kais.Deutsch.Arch. Inst. Athen. Abth. Vol. 14,p.222. Athens. 1889.

Note 270. Concerning date, inscriptions, and illustrations, see Mommsen, same work, Vol.1(1876), p.36; also Köhler, same work, p. 126.

9. The Gate of Hadrian in Athens formed the entrance to the precinct of the Temple of Zeus Olympios and to the new quarter of the city founded by Hadrian."This is the City of Hadrian and not that of Theseus" is on the frieze on the east side, while "This is Athens, the ancient City of Theseus" is on the west side.

Built of white Pentelican marble, this has a round-arched gateway about 21.32 ft. in clear width, that was formerly flanked by two Corinthian columns, whose bases remain on the west side and their architraves on the east side.

The columns stand directly before the wall without pilasters behind them. The masonry consists of a high plain base-course ((as on temple cellas) with a slightly projecting low band above it; then follows the masonry in regular courses, the surfaces of the ashlars being separated from each other by rectangular sunk joints. The angles of the wall project like antae, are dressed smooth on their faces, are finished with Attic bases and ugly Corinthian capitals, that have a freely projecting and unloaded egg-and-dart moulding above the astragal, with covering acanthus leaves only on the angles. The soffit of

the arch made of small voussoirs is smooth; the archivolts are divided into two bands, bordered by an echinus moulding and cove, and they rest on the plain piers with Attic bases and Corinthian capitals. The arch intersects awkuardly the architrave and a part of the frieze; the crowning cornice is treated as an Ionic dentil cornice.

More beautiful in proportions and nobler in detail is the richly designed upper part; it is composed of an entablature supported by side pears and half columns, producing three rectangular openings, the middle one being crowned by a pediment. The dentils of the horizontal main cornice are also used along the pediment cornice, as on the Tower of Winds. Acroteria bases on the pediment are still preserved.

10. The so-called Incantada in Salonichi (Thessalonica) is a work, whose purpose remains unknown. Pococke holds it to have been a monument of victory; Villoison, the entrance of a theatre, Clark, the propyleion of an ancient hippodrome or forum. Accord-
300 ing to Perrault and Durand, who held the only building allied to this to be a basilica, the "Tutelles" in Bordeaux, now entirely destroyed, this designation should be adopted. In the notes to the German edition of Stuart & Revett's work, it[271] is explained as being a tomb, similar to the Tomb at Mylassa.

Note 271. Die Alterthümer von Athen. Darmstadt. 1829-31. Vol. 2. p. 507. For Salonichi, see also Kinch. L'Arc de Triomphe de Salonique. Paris. 1890.

The designation now current is taken from the common tradition, that holds the building to be the remains of a gallery connecting two palaces of Alexander, explaining it as a work of magic, therefore receiving from the Greeks the name of Goeteia, or from the Spanish Jews settled there, that of "Las Encantadas" (magical diagrams).

The ruins stand in the Jewish quarter of the city and consist of 5 Corinthian columns, monoliths of cipclline, that support an entablature of Pentelican marble, whose frieze exhibits the characteristic curved form ornamented by pipes. The cornice has Ionic dentils; above it rises the attic story of the same material adorned with figures. (See Figs. 182, 215).

The protecting projections on the abacuses of the capitals are remarkable, which at the time were held by Stieglitz to be

the "scamilli impares" of Vitruvius. The good style of the figures and mouldings allow the building to appear to have been erected not later than the era of Antoninus, thus being not later than 193 A.D.

11. The Propyleion of Appius Claudius Pulcher in Eleusis was a structure of Pentelecan marble with the charming chimera capitals,(See Figs.209, 211) now only remaining in fragments. This "small" Propyleion at the second (reckoning from the outside toward the interior) enclosing wall has side walls at right angles to the wall containing the gateway (see plan, Fig.43), which were decorated by Ionic columns, while the antae and columns beside the principal entrance bear Corinthian-like capitals (represented in Figs. 209 - 211) with the acanthus bell, c chimeras at the angles, and scrolls, flowers and berries at the middle. The scroll ornament there does not exhibit the fluent form, as on the Choragic Monument of Lysicrates, although contrary to widely distributed and incorrectly restored publications; it is no longer permeated by the chaste fragrance of Grecian beauty of form of the good period, and in the unfolding of the flowers and in the berries, for example, recalls too much some violent turns on the really late ornament of the table supports in the House of Rufus in Pompeii, which is certainly the work of a Grecian artist.

Lenormant[272] ascribes this small propyleion to Appius Claudius Pulcher from inscriptions found there and deciphered by Henzen. Two nephews of the censor had the propyleion, vowed by their uncle, built during their sojourn in Athens, and the uncle dedicated it shortly before his death (48 B.C.). Those propyleions, whose parts are composed of all the orders, are therefore of earlier date, than that mentioned on page 250 under 5, the "great" Doric Propyleion, which according to the result of Lenormant's excavations and evidence, originated in the 2 d century A.D. and after the reign of Hadrian.

Note 272. Rev.Gen.de l'Architecture. 1868.p.54.

12. The so-called Gymnaseion, or more correctly, the Stoa of Hadrian in Athens,[273] built between 114 and 137 A.D., included in itself a state edifice, porticos, a library, Temples of

Zeus and of Hera, and a Sanctuary of all the gods. The foundations are partly preserved with a part of the superstructure, a piece of the wall with 7 monolithic columns of Carystos marble (cipollini) placed before it, 3.18 ft. diameter and 30.90 ft.
301 high, with greatly injured acanthus capitals of Pentilican marble, and one fluted column with its anta, which belong to an entrance portico.

Note 273. See Stuart & Revett. Die Alterthümer der Athen. German edition. Darmstadt. 1829 - 31. Vol. 1. 173, lief.4, pl. 7 to lief.5, pl.6; also Baumeister. Vol. 1.p.169. Extensive excavations have been recently made, which have fixed the ground plan of the building. See Praktika tes Arch. Hetair. 1885. Pl.1. 1886. p. 10, 11.

Three columns and one anta likewise remain from the Temples mentioned.

13. The Temple in Labranda in Asia Minor was a hexastyle building with 11 columns on its longer side; the plan consisted of a peristyle, pronaos, naos, and opisthodome; the floor of t the vestibule was one step higher than that of the portico.((Fig. 221).

Of the Temple, built of white marble, there still stand 16 columns, supporting the architrave and a portion of the frieze, while the cella and the roof are destroyed. The columns standing on the south side are not fluted, the bases of the antae are only roughed out, the mouldings on the architrave and frieze are still plain and without ornament, a token that the Temple was never entirely finished.

The previously mentioned tablets (Art. 204) on the shafts of the columns and on the convex frieze are worthy of notice. The cyma is nearly destroyed, but decoration by lions' heads is still recognizable; the steps are covered by rubbish and ruins, so that only the uppermost one is visible, and their number cannot be determined.

14. At the Tomb at Mylassa, the portico still stands on a bold rectangular substructure, an entrance to which leads to the interior, whose stone-beam ceiling is supported by plain piers. On the superstructure, 4 angle piers, between which are 2 peculiar coupled half columns on each side, bear the archi-

architrave with the frieze of ogee form, from which rose the stone ceiling in the form of a stepped pyramid, constructed by corbelling. Columns and piers are fluted for two-thirds of their height and exhibit in even more debased execution, as on the Tower of Winds, the form of capital found in the Theatre of Dionysos in Athens.

15. A Gateway at Mylassa shows similar capitals and cornice members and the twibill of Zeus is cut on the keystone of its archway.

16. In Mylassa is likewise found a votive Column with a rich, though mutilated, acanthus capital, that once supported a statue, with a tablet in the flute and the inscription:- "To Menandros, who was himself a benefactor of his country and was descended from benefactors".

17. Remains of a Temple near Ephesus, dedicated to Claudius Caesar at his deification, with richly ornamented entablature and frieze of ogee form.

18. The Corinthian peripteral building with 6 × 9 columns on a terrace in Pergamon measuring 196.80 × 224.68 ft., was entirely built of white marble and had a width of nearly 65.6 ft. and a length of more than 108.24 ft. The cella was that of a so-called temple-in-antis; the height of the columns was 32.14 ft., including base and capital. Bronze rosettes were attached between the horizontal modillions of the main cornice; the middle and side acroterias were shaped like leaf-covered bells, from which scrolls ascended, and on them stood winged victories. The temple court was enclosed by three one-story porticos, the eastern and western of these being only raised on three steps, while the northern rested on a podium 13.12 ft. high. The capitals of the columns of the porticos exhibit the same ornamentation by acanthus and sedge leaves, as on the Tower of Winds in Athens.

302 Two separate monuments also stood in the temple court, a rectangular and a semicircular seat, the former built by Attalus II, according to the inscription. Fig. 222[274] gives a representation of it with the adjacent porticos.

Note 274. Facsimile reproduction from Bohn, Alterthümer von Pergamon. Vol. 2. Berlin. 1885.

19. Here should also be mentioned the different, and often very rich architecturally, Scene Buildings of the great theatres in Asia Minor, which were chiefly executed in the most luxuriant corinthian style.

20. There should lastly be mentioned as a movable work of architecture, the Palace-Ship of Ptolemy Philopator, with its great peripteral saloon and its columns of cypress wood with Corinthian capitals of gold and ivory.

Chap. 4. Building Materials, Prices, Wages, and Erection.

227. Finds.

The uncovering of antique temples has been carried on at a grand scale during the last ten years, and this has not a little increased the material of inscriptions referring to buildings, whose meaning partly casts new light upon various arrangements, but has been able to decidedly enrich our knowledge of the various technical processes.

The well known Lex Puteolana, the contract for building a covered gateway to Puteoli, instructs us concerning the construction of a wooden projecting roof and its covering of tiles, whose lowest course was to be fastened by iron nails; the contract for the repair of the city walls of Athens afforded information relating to a kind of roof sheathing and a layer of straw and earth; the detailed description of the work for the Arsenal in Piraeus informs us about a simple roof, with the support of the roof ridge-beam by stone piers, and all dimensions and spans of timbers, together with the doubled sheathing of the roof and the coating of clay on this, the building contract of Lebadea gives the conditions of the agreement, the inscriptions of Delos and Epidauros describe the various kinds of materials, the places of origin of building materials, the construction of wooden coffered ceilings, the gilding of lilies and rosettes in the coffers, the ornamentation of framed doors with ivory, the glueing of wooden parts, the protecting coating of the same, the tarring of the roof tiles, the public letting of the work at the lowest price, and the wages of the workmen and the superintendent; the inscriptions of the Erectheion inform

us concerning the erection of the marble frieze, the construction of the ceiling of the cella of Athene Polias, the roof of the cella of Erectheios, the various painters and sculptors' work; others give facts relating to similar monuments in Eleusis, Troezene, Hermione, Tegea, Corcyra, Eretria, Lesbos, Piraeus, and other places.

228. Prices of Materials and Wages.

Those points of especial importance to building construction have already been referred to in the preceding chapters relating thereto; the following details may be added in regard to materials, prices of material, and wages.

229. Building Stones.

Of the kinds of stone chiefly employed in the Grecian mother country, the following are to be mentioned.

1. The bluish-gray compact limestone, frequently veined with yellow to reddish-brown, iron-colored calcareous spar, from the quarries of Lycabettos, from the Areopagus, the Hills of the Nymphs and of the Museion, was more commonly employed in the earlier period before the Persian War (Pelasgian walls and foundations of the old Temple of Athena on the Acropolis of Athens).

303 2. The Kara stone from the vicinity of Athens, a light white porous limestone, colored red or reddish in spots by iron nodules, frequently similar to travertine, was sawn into ashlars. (Foundations of the old Temple of Athena and of the Parthenon of Cimon).

3. The limestone from Acte (Aktites lithos) at Piraeus, of yellowish-gray to yellow color, a fresh fracture being white to light-gray, was chiefly used for foundations, but for the superstructure as well, as shown by the Odeon of Herodes Atticus and the Theatre of Dionysos.

4. Conglomerate stone, a kind of breccia, with white fracture, easily cut and sawn; mostly employed only in the middle of walls.

5. The compact limestone from Eleusis, of dark gray or b brownish color, was mostly used only for certain parts of buildings, sometimes only for decorative purposes on account of i its color, at others on technical grounds by reason of its

hardness.(Uppermost step of the staircase of the Propyleion in Athens; window sills in the same building; frieze of Erectheion).

6. The lower white and the upper blue-gray Pentilican marble from the quarries above the demos of Pentele were employed as a building stone for great public edifices, especially during the time of Pericles.(Olympeion, Propyleion, Temple of Nike, Parthenon, Erectheion).

7. The lower white and the upper blue-gray marble from Hymettos were more used during the period of Roman supremacy.

8. The coarse-grained Island marble from Paros and Naxos was relatively little used in Athens.(Roof-tiles in Olympia; relief-frieze of the Theseion).

9. The upper and lower White Attic marble was quarried and employed near Laurium and Sunion.

10. The gray, yellowish and red compact limestone of the chalk system and the limestone-conglomerate in the circuit of the Plain of Argos were especially employed for the prehistoric structures in Mycenae and Tyrins.

11. The light-bluish-gray and also the yellowish-gray marble from Doliana were used on the Temples in Tegea, Phigaleia, and also in Olympia.

12. The tertiary shelly calcareous sinter limestone was easily wrought while fresh and was sawn into ashlars; most buildings in Olympia (Temple of Zeus, Heraion, Palaestra, etc.) were built of it, as well as the Temple in Corinth.

There were further employed for building purposes:--

13. The marble from the Valley of Cinus near Sparta.

14. The marble from Atrax in Thessaly.

15. The marble from Carystos and southern Euboea, the so-called Cipollino. This and the red and black marbles also were chiefly employed for certain parts of buildings, preferably during the Roman imperial period, for example for the shafts of the columns of the so-called Stoa of Hadrian, and for the Exedra of Herodes Atticus in Olympia.[275]

Note 275. See Lepsius. Griechische Marmor- Studien. From Abth. d.Kön.Preuss.Akad.d.Wiss.z.Berlin.1890. Berlin. p.11-51, 114-133; also Gottgetreu, G. Ueber die antike Marmorsorten, ihr Vorkommen, und ihre Verwendung in Alterthum. Zeit.f.Bauw.1888.p.103-132;

Also Durm. Ueber die naturliche rostbraune Färbung des Marmors an den Bauten der Akropolis in Athen. Same work, 1871.p.471; lastly, Becke. Min.u.Petrag.Mitt. Pub. by S. Tshermak. New Series (1879).p.57.

The white marble of the locality chiefly came into use for the buildings on the soil of Asia Minor.(Ephesus, Sardes, etc.), while trachyte was also used for the older monuments(Assos).

In Sicily and Lower Italy, only the white-light-gray or yellow tufaceous limestone mentioned under 12 was considered. (Akragas, Paestum, etc.), which was always received a coating of stucco.

Walls of sundried bricks were protected by a coating of stucco on the external surfaces. Examples of this are the City Walls of Eleusis and of Athens; statements of the burning of bricks are at least not found in the building accounts.

Chopped straw was mixed with the clay. Accounts for this, as well as for calves' hair, clay, fine and coarse sand, and for broken stone, are still preserved. But nowhere in the ancient period do we find expenditures for slaked lime, since the cut stones were held together by wooden or metallic dowells or cramps, and air-dried bricks were set in clay mortar.

304. For preliminary outlining on stone or wood work, red or black colors were employed, items for this being preserved in the building accounts.[276]

Note 276. See Choisy. Etudes Epigraphiques sur l'Architecture Grecque. Paris. 1884. p.215-228.

230. Mentions of Places and Prices for some Building Materials.

For a Temple built of tufa on Delos, the tiles were brought from Syros and cost 15 ¢ per pair, exclusive of freight and duty; adding these, they came to somewhat more than 18 ¢. Clay bricks (air-dried) were each one ft. long and 1/2 ft. wide, costing $7.20 per thousand; of which $6.48 was for making and 72 ¢ for value of materials. A Corinthian tile cost at the factory there 15 ¢ and 18 ¢ delivered in Athens. The ordinary tiles made elsewhere had the same price as the Corinthian, exclusive of the cost of transportation.[277]

Note 277. One obolus equals 1/6 drachme or is 3 cents.

Up to $14.40 was paid per cubic foot of cedar wood; elm wood varied in price between $1.44 and 3.60, as well as ash wood.

The day's wage for a workman, who boarded himself, amounted to from 27 ¢ to 36 ¢, and even 45 ¢. It exceptionally fell as low as from 18 ¢ to 22 1/2 ¢.

According to the building accounts preserved, the building woods employed in various Attic buildings were cedar, elm, ash, and cypress. Olive wood was also used for dowells.(For example, in the Walls of Athens). They were largely brought from Macedonia, but the greater part was purchased in Corinth in the form of sills, beams, posts, pillars, piles, plates, or rails, boards and thicker planks. The wooden dowells and anchors were coated externally with tar, as well as the wood-work of the roof and the joiner's work. The latter was also varnished with a resin. (Mastic varnish ?).

The timbers for building usually have large dimensions, for example, the ridge-beam of the Erectheion, which was 20 ins. wide and 23 1/2 ins. high at the side(thus not to the top line), as may be deduced from the recessed apex stone of the pediment, lying on the Acropolis. According to the contract for building the Arsenal near Zea, architraves 30 ins. wide and 27 ins. high were required, with planks and boards 6 ins. wide and 3/4 to 1 1/2 ins. thick.

231. Specifications for Erection.

Specifications for the construction of buildings are thorough and frequently circumstantial, taking account of all possibilities.

Against lazy contractors, the officials in charge of the building always reserve the right to carry it on under their own management, if the former do not fulfil the requirements of their contract.

Proof of this statement may be found in the following specifications for work for the Temple of Zeus at Lebadea in Boetia, which date from the beginning of the 2 d century B.C. It was found in the year 1875, cut on a marble tablet 6.07 ft. high, 3.12 ft. wide, and 8 ins. thick, filling two columns side by side, with 94 lines and 8500 letters.

/ It was first submitted to scientific criticism by Fabricius

in the Essay "De Architectura Graeca commentationes epigraphicae" (Berlin 1881). It was made known to professional circles by the Centralblatt der Bauverwaltung (1882, p.5, 11). Choisy, the well known French writer on architecture, treated the same subject under the title:-- "Un Devis de Travaux Publics a Livadie"(Paris. 1884).

We give a verbatim translation from Fabricius as follows:--

1. (If the contractor fails to complete any part of the work undertaken by him, then will the Building Commission for the Temple afterwards omit this portion). The contractor then has to repay to the Building Commission for the Temple (the money paid him in advance) and the fifth part of the entire sum, for which he has undertaken the execution of his part of
305 the entire works. (This money), together with any extra costs, and with the amount of the penalty imposed on him, shall all be collected from the contractor and his bondsmen by the Building Commission for the Temple. If this cannot be done, then shall their names be posted on the "white board".-----We,(the Building Commission for the Temple) award all metal-work, and of stone-work, the making of the slabs for inscriptions and of the caps at the same prices; but he (the contractor) shall make the foundation bases as extra work. For the limestone ashlars, he shall receive the fixed price of 5 drachmas (90 ¢) each, for as many as he delivers, and for the cutting and painting of the letters, one stater and 3 oboli ($3.69) per 1000 letters. --- But after he has received the advance payment, the contractor shall forthwith (commence and) execute the work within 10 days, by engaging therefor at least 5 skilful workmen as assistants. But if he fails to perform any stipulation made in the contract, or is convicted of an error, then shall he be as severely punished by the Building Commission as he appears to deserve, for not performing the contract stipulations; and if one of his assistants be convicted of an error, he shall be discharged from the work, and be no longer permitted to assist; but if he be disobedient, then shall both he and the contractor be punished. ----- If it be found advantageous during the work to change any of the prescribed dimensions by increasing or diminishing them, then shall he execute it in accordance with our directions.----

---But the original bondsmen and the(first)contractor shall not be discharged from their obligations, until he, who has undertaken the work awarded the second time, shall have furnished sufficiently safe bondsmen. For all works previously executed, the original bondsmen shall be responsible to the last recourse. The contractor shall in nowise injure works now in the sacred precincts. But if he should injure anything, then shall he make it good again at his own cost, during a time to be fixed by the Building Commission for the Temple. And if the first contractor, who has chahge of the setting, spoils a stone, then shall he furnish instead another perfect stone at his own cost, without delaying the work. He must remove the spoiled stone from the sacred precincts within five days; if he fails to do so, the stone will then belong to the sanctuary. But if he furnishes no substitute and does not make good the injury to the building, the Building Commission for the Temple will also deduct this. The cost thereof and one- half more (additional) shall be paid by the contractor and his bondsmen. If a stone breaks in two of itself, then the contractor in charge of the setting shall receive no punishment on account of this stone.---If the contractors disagree in regard to one of the written stipulations, then after the members of the Building Commission for the Temple have been sworn, they shall decid the (case)on the spot. More than one-half their number must then b be present. Their decision shall be legal.---If the Building Commission stop the contractor from delivering the stone, they shall make good to him the time for which they delay him.----- After the contractor has given bondsmen according to the law, he shall receive the first payment on account for the portion of all inscription slabs undertaken by him, and for the caps lying thereon, when he deposits the tenth part of the entire (sum as security). After he has shown that all (slabs and caps) are completed, are true on all sides, finished according to the contract and set with lead, to the satisfaction of the Building Commission and of the Architect, then shall he receive the second payment on account for all letters of the inscription, according to the fixed price and according to the number computed on the basis of the original, when he likewise deposits the tenth part

of this (sum). Finally, after he has completed the entire work, and after this is accepted, he shall receive the tenth that was deposited. Also for all limestone ashlars set by him, as well as for all letters cut by him afterwards, he shall receive the fixed price together with the tenth, unless some deduction be made as a penalty. --- If any extra work be required for the benefit of the building, he shall execute it according to the same rate, and shall receive what is coming to him therefor, after he has shown that it is good. --- If it happens that the excavation be not firm, he shall then pave it with as many limestone slabs as are necessary, and shall likewise receive what is due him therefor, together with the tenth. --- But he shall also place 11 caps on the inscription slabs already existing, after he has cut the slabs on top, and has extended the existing scaffold as we direct. He shall remove the iron cramps already let into the slabs, when they project and hinder the cutting, and after deeper holes have been drilled, he shall reset them and cast them properly with lead. He shall further insert in these (11 caps) keyed dowells and cramps and cast them in with lead, and shall finish everything as already described above. --- We award also these caps, those 6 ft. long
306 and 5 ft. long to be at the same price the others cost; those 3 ft. long, 4 in number, we will count each two as a single cap. --- He will likewise receive payment on account for these caps, when he has shown that the inscription slabs are cut, set, and cast in with lead, and that the caps placed on them are clampded above. He shall also receive payment for these, after depositing one tenth, exactly as stipulated above. --- After he has joined together the caps, and has shown that they are true, set with lead, complete, are clamped on top and range perfectly with each other, then shall he wash the inscription slabs with soda, clean and wash the letters, for so long as we require. --- But everything else, not mentioned in this agreement, shall be done according to the law and to the (general)ordinance for building the Temple.

2. After the contractor, who by means of (open) tender of the Building Commission for the Temple, has undertaken to prepare and set the pavement slabs along the long side for the Tem-

Temple of Zeus "King", and for the external passage around the cella on the side toward the south, to be of hard Lebadean stone, 13 in number, corresponding in size, breadth, and thickness to the pavement slabs already finished and set along the long side, beside which these are to be set, --- then after the contractor has delivered the rough stones, uninjured, near the Temple, and they have been found good and in accordance with the prescribed dimensions, he shall first dress the under sides of all stones true and out of wind, without defects and truly plane, and with a sharp and fine tooth chisel, he shall dress all parts, which are to rest on the sills, and (those parts set on the filling) between the sills, for a width of at least two feet from the front edge joint; but the middle portion still uncut is to be dressed with a coarse tooth chisel, and he is to make everything true to a straight-edge, at least as long as the stone to be cut, and not less than 6 fingers thick and 6 inches high. Then he is to chisel away from the under side of all pavement slabs that portion, which lies above the filling, from the rear edge joint for the given length and width, dressing the cut surface true as particularly specified for the under side, thereby producing an open spa space between the dressed surface and the filling, not more than a little finger in depth. --- But he shall likewise dress all the rear edge joints of the pavement slabs entirely true, straight and not curved, without defects, plumb, perfect by the[23] square, accurately cut, and indeed for the width of at least 9 fingers on the three margins with a smooth, sharp, broad chisel, carefully applying the red chalk test, but shall cut the yet untouched middle portion with the coarse tooth chisel, and he shall (then) undercut all the rear edge joints as at a door (using therefor) a stone straight-edge and carefully making the red chalk test, not without correcting all straight-edges by the (stone standard) straight-edge preserved in the sacred precincts, as often as we direct. He shall likewise cut the (front) ledge joints of the pavement slabs already in place, against which he is to set (the new ones), after he has stretched the line on the upper surface straight from the left, both in the portico, as well as along the longer side,

and after he has drawn the line in presence of the Architect, he shall cut away the existing allowance for cutting with the mallet(and chisel), thus producing the given width, and making everything true and with sharp angles. He shall further true up the upper edge of all the pavement slabs, 13 in number, already set by means of a straight-edge 20 ft. long, 6 fingers thick and 6 inches high, and shall test them with red chalk, using a smooth and sharp wide chisel therefor, and shall make everything straight, without defects and quite true, for a width of at least (9) fingers. (He shall dress this flat margin) after he has forst cut guage spots near the joints on each stone, true with the square and the stretched line, according to which the dressing is done. In the same manner shall he also work to the line (stretched) in the portico. Then shall he undercut the edge joints of the pavement slabs already set, against which he is to set (the new ones), as at doors, and to fit the stone straight-edge, exactly as specified for rear edge joints. ---Before he sets the stones, he must dress the sills and the filling stones on the upper surface, using the sharp fine tooth chisel on the sills, but a blunt chisel on the filling, corresponding to the finished and set (parts), and he shall show that everything necessary has been dressed. --- Then he shall set the pavement slabs according to directions, commencing to set them at the left, as will be indicated to him; each stone against an edge joint, setting a wedge between them, so that it accurately fits on top against the finished and set slabs. And he shall use pure oil and Sinope red chalk for all straight-edges. If he does not use Sinope red chalk and pure oil, then shall be be punished by the Building Commission for the Temple and the Boeotarchs; neither shall he set the stones permanently, until he has proved to the Building Commission for the Temple,
307 that he has used good Sinope red chalk and pure oil. --- He must show the dressing and jointing(of the slabs) to the Architect, and the edge-joints and under sides of all stones to the Assistant Architect, while they are being moved; (he shall indeed) rub the under sides with olive tree sap, and as soon as (the stones) are correctly set, neither bruised nor in wind, (but rather)faultless, nothing scattered beneath them, and they

fit against each other accurately, while he in the dressing cuts away the (high places) of the portions to be dressed with a fine tooth chisel made sharp, so far as they rest on the sills, or with a blunt chisel, where they rest on the filling; but he shall rub the edge joints with pure oil and use a smooth broad chisel made sharp. When the work is finished and the joints have been washed with soda and rinsed off with pure water, he shall fasten(the stones). The insertion of dowells, cramps, and double-dovetails, as well as their weight, and all setting in lead, shall be proved to the Building Commission for the Temple by the contractor personally; he shall not set anything permanently without this proof. But if (in spite of this) he does set anything, then must he raise it up again and set it anew; he shall then be punished by the Building Commission for the Temple and the Directors as severely as he appears to have deserved, had he not executed the provisions of the contract; and if one of his workmen be convicted of an error, he shall be discharged from the work and no longer be permitted to labor thereon; but if he be disobedient, then shall both he and the contractor be punished, and he (may) set no stone with lead, before he has fulfilled the prescribed decision. --- If it proves advantageous to the work to make any of the prescri- [illegible] in accordance with our orders. --- As soon as he has set all the pavement slabs beside each other, he shall dress the upper surface in the same manner as the bearing and finished ones, and true it off according to the great straight-edge, using red chalk and the tooth chisel, (first) cutting borders around the stones, and with a level extending them outward from the guide spots existing on the pavement slabs, after he has prepared for this cubes of dry wood from the wild olive tree. And as soon as he has shown that everything is straight, entirely true --------.

289. Building Enclosure and Architect's Commission.

We deduce from the inscription found on Delos, that during the erection of a building, the building ground was enclosed by a wall of air-dried bricks, and that the average salary of an architect per year of 12 months was $123.80, which was likewise paid to the foreman of the work. Homolle therefore wishes to ascer-

understood by architekton not the designing artist, but rather the superintendent"(he is an artisan rather than an artist, a mere superintendent)"

Note 279. See Homolle. Comptes et Invent. des Temples Deliens. Bull.d.Corr.Hellen.Athens and Paris. 1890, 1886.

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B. SECULAR BUILDINGS AND TOMBS.

Chapter 5. Public Buildings and Designs.

a. Theatre.

233. Purpose.

"The Drama, far from being condemned by a jealous priestly caste, far more itself even served for the worship of the gods, and in every larger Greek city, a theatre was just as certain to be found as a temple."

Dithyrambs and divinely inspired songs were sung therein, and a separate Logeion and Theologeion were erected for the highest revelations of wisdom, or of fate. Poets here declaimed their verses before the people; it was honorable for any citizen of the state to support the theatre and an honored office by birth, or later of the monied nobility, was to undertake the supervision or arrangement of the chorus. The state provided for the actors, who were placed under the poets; it likewise made attendance possible for those without means. Plays were not given for profit, but for worship; until the period of decadence, till the wit and bitter criticism of Aristophanes appeared, the theatres were in truth temples of art, accessible to the entire people, the centre and focus of political, religious, and artistic life. They deteriorated as the people were overcome by the orient, or only found enjoyment in wrestling contests, chariot races, or in the murderous games of the arena, and these became the sole and the last art enjoyments, until Christianity likewise terminated them, after obtaining control.

1). Arrangement and Construction.

234. Origin and Development.

The beginnings of the Greek theatre are rooted in the worship of Dionysos. The dithyramb, the festal poem, that glorified the great deeds and the sorrows of the god, contained the germs of tragic poetry, while those of comedy are to be sought in the unrestrained songs of the festal jubilee and in the phallic hymns.

His deeds were sung by the line of dancers around the altar of the god; thus he formed the centre of the festal cel-

celebration and the centre of the festal place.

The space around it, on which the chorus moved, became the orchestra, the place for dancing. Adjoining this was the space for spectators, the theatre proper.

So long as merely alternation of the chorus and its leader expressed the dramatic play, these two divisions sufficed; a third one became necessary when the separate actors appeared.

Thespis introduced before 500 B.C. an actor not belonging to the chorus. The speaking then alternated between him and the leader of the chorus; the chorus then struck in less frequently with its songs. While the chorus then retained its place, a special place for the actors, the stage, was arranged behind the circular space for dancing and acting.

235. Elementary Parts.

Therefore a theatre had to satisfy three requirements: a level place for the chorus (orchestra, konistra), a place for the actors (skene), and seats for the greatest possible number of spectators (theatron). In order that the actors might be better seen, a raised place for their acting was arranged, a proscenion, a stage for the scene, at the expense of the originally entirely circular orchestra.

236. Building Material and Location.

The earliest theatres are assumed to have been built of wood, scaffolds placed in the open air for the temporary use of the actors and spectators; the orchestra was a level space strewn with sand, at whose centre stood the sacrificial altar, and tradition connects the building of permanent theatres with the frequently occurring fall of such scaffolds of boards.

It must be natural and probable, that where this took place, the means afforded by nature for a building were first utilized, and the slopes of hills were employed as the place for spectators. The necessary seats could thus be constructed without much labor, the orchestra was leveled off, and there was afterwards only the stage to be built of wood in the early period, in accordance with its origin; even in the later theatres, its floor continued to be of the same material, certainly required by the machinery of the theatre.

The Theatres in Athens, Argos, and Thoricos, exhibit this utilizing of the peculiar nature of such slopes. They were al-

always sought by the people, for why should not man make the most of the means, which seems to have been adapted to his purpose by nature, to have in a sense forced into use? The expense of foundations and walls, of extensive substructures, of the costly masonry of the facade and its ornamentation could be saved; by using the mountain paths as means of access to the upper rows of seats, expensive flights of steps were avoided.(See Theatre of Dionysos in Athens). Vitruvius likewise holds the location on mountain slopes to be good, on account of the construction of the foundation walls.

It was evidently for these reasons of economy, that the ancients chose such slopes as the site of the building, and not the fable of the natural stage or of the beautiful view, which on account of the artificial scene could scarcely be seen, and indeed not at all from the better places and the seats of honor. Texier already remarked in reference to this point, "that it is to be considered as a great mistake, that in any theatre whatever, landscape served as a background." A back to the stage was necessary for acoustic reasons.

Few Greek theatres are built on a plain, like those of Mantinea and of Alabanda; those in Myra and Aegai have partly utilized the rocky slope as a substructure, only the structures at the sides having masonry substructures and walls; the Theatre in Antiphellos is excavated in the mountain for a third of its extent, but is otherwise founded on the rock.

Vitruvius (Book V, Chap.3) requires first for the theatre "a healthy site, since the spectators will mostly be present there for long periods; it must not be exposed to the influences of the south; for as the sun fulfils his course, there
3/0 is no possibility for the air to circulate, and enclosed within the curvature, it becomes hot and moist during the play, evaporates the moisture from the bodies and lessens it----". This arrangement does not always appear in existing monuments.

237. Form of the Theatre.

The forms of theatres remaining to us are not invariably the same, but in the fewest cases is the original one in all its parts. It originated during the course of more than 500 years, within which period the nature of the drama changed,

and with it also the arrangement of the building. Fashion and love of display on the one hand, and impoverishment on the other, gave occasion for alterations. Therefore in the fewest cases do the rules of Vitruvius accord with the practice on the site itself.

Vitruvius (Boog V, Chap.7) says:- "The form of the Greek Theatre is to be so arranged, that according to the magnitude of the diameter of the lower space, a circle is to be struck from its centre, within which are to be drawn at equal distances three squares touching the circle. Then where the side of one of these cuts off a segment, the limit of the stage is to be drawn, and parallel to this a tangent to the circle, on which is to be placed the rear wall of the stage. Likewise through the centre of the orchestra is to be drawn a straight line parallel to the proscenium, and where this intersects the circle (at o and p, Fig.223) on the right and left at the ends of the semecircle, the centre is then drawn, and after the dividers are set there and extended to the right side (to p), describe a circle from the left interspace (from o) to the l left side of the stage (to r), and after setting the dividers on the left end of the semicircle (at o), describe a circle from the right interspace to the right side of the proscenium. (to s). Thus by the circumference described from these three centres, the Greeks had a spacious orchestra and the background of the stage was moved backwards, with a lesser depth of the framework of the stage".

The plans given in Fig. 223, of the Theatres in Iassos, Telmissos, and Aizani, do not agree with the preceding rule, just as little as the Theatres in Syracuse, Egesta, and Tyndaris, in which the orchestra exhibits the so-called open or straight horseshoe shape, or the Theatres in Epidauros and Mantineia, in which a circular segment of 185 to 260 degrees forms the orchestra. The previously mentioned Theatres in Athens, Argos, and Thoricos, deviate entirely from the regular form, since the shape of the rocky slope determined their forms.

238. Space for Spectators. (Theatre proper).

1. The space for the audience consists of a number of step seats, generally extending concentrically around the orchestra,

surrounding it in ever increasing circles and rising, so that a spectator may conveniently look over the others. Vitruvius prescribes 1 to 2 as the ratio of height to width of the rows of seats, but this is usually 4 to 7; the steps are frequently steeper than even Vitruvius' proportions produce.

239. Arrangement and Execution.

According to the same author, the rows of seats were interrupted by flights of steps extending upwards. These steps divided the audience space into wedge-shaped portions (kerkides); such a staircase corresponds to each angle of the squares drawn in the scheme of construction in Fig. 223, that adjoins the audience space. Yet in none of the examples represented does
311/ the execution of this rule occur; the stairways are needed and
312 are built in greater number, unbroken and straight, without windings.

But the rows of seats were interrupted upwards, for broad concentric passages (diazomata) were added, that extend either singly or doubly, and parallel in the last case, one being higher that the other (see Epidauros and Patara). These concentric passages correspond in their proportions to the height of the theatre; for acoustic reasons, their walls must not be higher than their width. A straight line, stretched from the lowest to the highest step, must touch all angles of steps and of the dividing passages.

Most theatres have in their extent two such divisions or ranks, separated by concentric passages, with approximately the same number of step seats in each, and thus, for example, these Theatres have:--

	Step Seats in:-	
	1. Division.	2. Division.
Theatre in Myra.	27.	20
Theatre in Aizani.	16	Destroyed.
Theatre in Patara.	15	15
Theatre in Aspendos.	21	18 [279]
Theatre in Syracuse.	46 + 15	----
Theatre in Antiphelios.	26	----
Theatre in Telmissos.	28	-----
Theatre in Perga.	40	----

Note 279. Niemann & Petersen (p.102) give 20 + 19 + 1 row on the diazoma or 40 seats in all.

Vitruvius requires in the second division additional flights of steps midway between the extended staircases of the first division, "and these must always be doubled in number in each successive divisiin added", a rule that in reality is almost invariably never obeyed.

The seats were either cut in the solid rock (Argos), made of ordinary limestone (Myra), entirely of white marble or of both materials used together (Iassos, Athens, Corinth, Sparta), of gray marble (perga), plain or artistically carved, or ornamented by lions' paws.

The surface of the seats is cut lower at the back, so that the positions of the feet of those sitting higher are indicated, or they were hollowed out, as in Athens and Sparta, to firmly hold cushions. On the higher seats, the rolled toga or cushion was scarcely lacking on the seat of hard, cold stone.

The first row of seats frequently had high stone backs, sometimes artistically wrought, as in the Theatre of Dionysos in Athens (Fig. 227), seats of honor for generals, state officials, foreigners, and native guests of honor. The Theatres at Aizani, Myra, and Side exhibit a raised passage around the orchestra beside the lowest row of seats.

Next the stage, the rows of seats were limited at the sides by a parapet wall, that followed in an inclined line, or in benches of the inclination of the seats.(See Theatre of Velia in Fig. 234).

The exterior near the uppermost row of seats was either formed by a plain wall, concentric with the rows of seats (Egesta, Cnidos), by a portico, externally closed (Tyndaris, Laodiceia),
313 or by an areade portico, as in Aspendos.(See Fig. 234).
314 The walls were built of great limestone ashlars, without the aid of mortar or iron, faced with marble slabs (Aizani), were of white limestone likewise without mortar (Myra, Iassos), or were of rough blocks with a facing of marble (Cyzicos).

240. Dimensions.

The dimensions of the space for the audience were chiefly great, in accordance with their purpose of seating a great number of men; thus, for example, the theatres were:--

Theatre in Aizani.	183.68 ft. in diameter.
Theatre in Egesta.	206.64 ft.
Theatre in Iassos.	246.00 ft.
Theatre in Cyzicos.	328.00 ft.
Theatre in Syracuse.	492.00 ft.
Theatre in Laodiceia.	492.00 ft.

Among the greatest were the Theatres in Miletus and Megalopolis (see Pausanias, Book 8), the latter seating 44,000 men, while the Theatre of Dionysos in Athens seated 30,000, and that in Laodiceia could accommodate 10,000 spectators.

The most beautiful theatre is admitted to be that built in Epidauros by Polycleitos, "the most important in proportions and beauty." (Pausanias, Book 2, 27).

241. Acoustic Vessels.

The voices of the actors should also be loud and clearly understood by the most distant auditors; but with the considerable dimensions and the uncovered location of the theatre, this does not seem to have always been the case.

The proposal of Vitruvius to make special arrangements in the theatres in order to increase "the distinctness of the voices" of the actors, certainly relates to this.

Therefore in theatres built of solid materials, i.e., of masonry of rough stone, ashlars, or marble, and which material cannot resound, he desires the arrangement of acoustic vessels in the audience space, that are especially designed to increase the distinctness of the tones, which proceed outwards in a semicircular form from the stage as a centre and enter the cavities of the acoustic vessels, thus producing by a combination of sounds a corresponding harmony. He indeed states that theatres were annually built in Rome without any attention to such acoustic vessels; he even says that none of these were to be found in Rome; but there were such in the provinces of Italy and in most Grecian cities. L. Mummius brought such acoustic vessels to Rome after the destruction of Corinth. But this arrangement is not mentioned in all ancient literature now known; only the anonymous author of the essay "De fabularum ludorum theatorum scenarium ac scenicorum antiqua consuetudine" mentions them. In the numerous known theatres on the soil of Italy, Sicily, Greece, and Asia Minor,

no acoustic vessels nor even vestiges of them have been discovered. One is therefore tempted to support Texier's opinion, according to which Vitruvius indeed speaks of his own invention, that was not adopted.

Note 280. See Des Vitruvius zehn Bücher über Architektur. Translated by F. Reber. Stuttgart. 1865. p.147, note 1.

Vitruvius prefers bronze vessels, or if there be not sufficient means to provide these, then "resonant pottery vessels;" they should be made in proportion to the magnitude of the theatre, "and indeed so, that when they are struck, they can give in the separate vessels the tone of the fourth, fifth, and the entire series extending up to the double octave." They are afterwards placed in small cells built beneath the seats of the theatre, in accordance with their musical order, and so that they touch no wall, have space around them, with an open space likewise at the upper open end; they should be set inverted, and have wedges beneath them on the side next the stage, at least 1 1/2 feet high; corresponding to these cells, openings 2 ft. long and 1 1/2 ft. high are left in the beds of the lower steps. The arrangement of the sound openings "in the beds of the lower steps" makes the entire scheme very problematical in a filled house.

For theatres of not too great dimensions, Vitruvius requires 13 chambers separated by 12 equal intervals, in the height of the first concentric passage. The peculiar form of the substructure of the concentric passage of the Theatre in Aizani exhibits 13 such divisions; one is tempted to assume these to be acoustic cells (Fig. 285), since the number and location corresponds with the statements of Vitruvius, and the restoration of the lacking parts may be easily made to satisfy the descriptions of Vitruvius; yet I might recognize in the division walls, cut from a single block, merely the supports of a row of seats, whose form was required by the conditions of the ground, the inclination of the step seats, and the plan of the diazoma. The statements concerning the discoveries of acoustic chambers, etc., in Scythopolis and Lyktos are now termed untrustworthy.

Vitruvius requires three horizontal series of chambers for great theatres, the first for the harmonic scale, the second for the chromatic, and the third for the diatonic scale.

242. Visual Distances.

The visual distances for the most distant spectators are no less to be mentioned, since they amount to:--

Theatre in Telmissos.	159.08 ft.
Theatre in Patara.	160.72 ft.
Theatre in Aspendos.	177.12 ft.

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Yet the specaator easily comprises at a glance the orchestra and the stage, the "thymeliker" and "skeniker" (see Fig. 223); the spectator in the worst place would not be able to view s such caricatures as the occupant of the highest row and of the front parterre in our modern theatres, in which the group of players are sometimes viewed in horizontal projection, or one may sometimes wonder at their chins and nostrils, while the foot-lights cast shadows upwards on their faces.

243. Orchestra.

2. The orchestra, the space on the level ground, was originally bordered by the "tent" (skene), later by the stage (proskenion) and the lowest row of seats: it was the place where t the chorus stood, and it measured from 1/5 to 1/3 the entire diameter of the theatre. At its centre, thus nearer the stage than the audience space, was the thymele, the small choral stage derived from the altar of Dionysos. Side passages (paradoi) from 6.56 to 16.40 ft. in width, by which the chorus entered, led to the orchestra(see Theatre in Patara), which were accordingly closed by very simple means, probably often only by a latticed door.

Note 281. In the Grand Opera House in Paris, for example, the length of the visual ray drawn from the eye of the actor at the foot-lights to the furthest row of seats of the upper gallery is only 124.64 ft.

The ground was leveled with sand, covered by boards during performances, on which the places of the choir were indicated
3/7 by lines. The Orchestra on Delos had a mosaic pavement, and in the Theatre of Dionysos in Athens had a (later added) floor of marble slabs laid in a pattern.

Beneath the floor are found the channels for carrying away the water from rain, from cleaning, and that used for sprinkling in hot weather in the later period.

244. Scene.

8. The stage and the stage-building. A flight of steps led from the orchestra to the proscenion (Fig. 226).[282] Originally built entirely of wood, its floor should not be less than 5 nor more than 12 ft. above the orchestra, according to Vitruvius. It was a planked stage for speaking, beneath which was the hyposcenion, whose front bordered the orchestra, and which received the machinery, the arrangements for lowering, etc.

Note 282. From Mon.d.Inst.di Corresp.Arch. Vol. 4 (1844), Plate 2.

The proscenion a was architecturally enclosed on three sides, the structure at the rear being the ancient scene proper, those at the ends being termed parascenes.

But little of this chief part of the ancient theatre still exists; the perishable nature of the materials and the continual changes permit the original form to be now scarcely determined; almost everything of the stage-buildings now existing dates from a later period.

The stage in the older works is entirely separated from the audience space, a mark of purely Greek design; it extends in the later to the theatre, or is architecturally connected therewith.(See Aspendos).

In some places (Syracuse, Sicyon, Egesta), it is partly cut in the solid rock, and in others it is constructed of cut stone, or is begun in the rock and extended and completed with dressed stones. The scene proper, the front wall of the building behind the stage, then generally represents a piece of splendid architecture, a palace facade with three or five doorways.

The outside doorways of the facade with five doors probably led to the side scene rooms, while the middle doorway, "that should have an ornamentation suitable for a royal palace" (Vitruvius), as well as the two side doorways (doors for guests) opened on the stage. The parascenes were of simple form; where these are lacking in a stage-building otherwise preserved, they were indeed of wood. The architecture of the scene in Aizani extended down to about 5.9 ft. above the floor of the orchestra.[283]

Note 283. See Le Bas, pl.6, 4. Niemann & Petersen give in Aspendos in their recent drawings no stone logeion at all before the stage wall (see Pls. 24, 27), but assume one of wood 5.25 ft. high for that place.

318 The stage wall is best preserved at the Theatre in Patara, (Asia Minor), dating from the era of Hadrian; it is still almost complete, the external facade being subdivided by Doric pilasters and in a simple yet ravishing style(Fig.224).[284] Five doorways led to the scene and beneath them in the hyposcenion were five doors to the machinery room. The corbels for supporting the series of beams in the logeion are still well preserved.

Note 284. Also see Texier.

The scene was protected overhead by a projecting roof (see Patara and Aspendos; the holes for the wooden construction of the roof still exist in the latter); the occurrence of the roof in the best period is uncertain.

245. Decorations.

But in addition to these monumental and permanent decorations, others of movable character were in use; large painted scenes were stretched before the rear wall and narrow side scenes were placed at the sides.

The latter were called periaktes (turners) by the Greeks, according to Vitruvius, and were in the form of triangular prisms; on each side was painted a separate decoration, that came into view by rotating the side scene.

Pollux mentions that the ornamentation on the periaktes was partly of wood and partly of cloth, and was let down from above. According to Servius and Pollux, the decoration belonging to the scene wall was of cloth; so far as possible, this was stretched before the beginning of the drama; it therefore hung in front of the wall. The mode of fastening it is unknown.

We further know that Agatharchos painted scenes in the time of Aeschylos, according to Vitruvius, the same Agatharcos left a book on perspective painting.

There was also frequently built next the stage wall a separate elevated stage for gods (theologeion or stage of gods).

246. Machinery.

Concerning the machinery arrangements of the theatre, we know that rolls (ekkyklema) were in use, "on which the interior was shown, often the stage wall was opened"; also lifting and supporting machines (aiorema), by which gods and heroes appeared suspended in the air (Aeschylos, Prometheos, etc.); likewise apparatus for thunder and lightning, sinking traps in wooden floors, stairways to the lower rooms, by which g ghosts and furies ascended and descended.

247. Time of the Play and the Play.

The play was not given daily, but only on certain festival occasions, then commencing in the early morning in the open air; a later period first required the covered audience room.

Pantomime plays were unsuited for wide and large rooms; hence the actors were made to appear larger than they actually were by the use of various artificial expedients, such as wearing shoes with thick soles (cothurnus), the face-masks with a kind of toupee, by padding the breast and body, and by enlarging the hands by gloves.

Representation in festival plays was very simple in the early period. The body was clad in a light apron, the face daubed with lees, the head wound with parsley, and the cheeks covered by leaves, this being the oldest costume; other modes of coloring, masks of linen, bark, or wood, came into use only later.

319 Only a single flute-player originally accompanied the chorus, in this accompaniament the flute being subordinate to the singing. the flutists later played solos and lead the singing' the dancing step became dance figures (schemata) by turnings and twistings; "in which the meaning of the song appears more or less clearly to the eye."

A view of the proscenion during the presentation of a Greek comedy is given by a painting in several colors on a black ground on a vase (krater) at Lentini. The front wall of the hyposcenion is ornamented by candelabras and pearl-beads. at the centre is shown a flight of steps leading from the orchestra to the proscenion (Fig. 226).

Rich figure decoration in relief is shown by the front wall

248. Porticos.

4. The porticos. Vitruvius also requires porticos behind the stage, "so that when sudden showers of rain interrupt the play, the people may have a place to which they can withdraw from the theatre", and he cites as such the Stoa of Eumenes in Athens, that was erected between the Theatre of Dionysos and the Odeion of Herodes Atticus, as well as the porticos on both sides of the stage in Tralles, over a stadium in length (600 ft.), and others. (Also see the illustration of the Theatre of Patara, Fig. 224). The width (depth) of these porticos must equal the height of the external columns.

The grounds between the porticos were then indeed decorated by formal gardens, fountains, statues, etc.

The theory transmitted by Vitruvius and by Pollux and generally accepted, that also in the Greek theatre during a certain period, the chorus was in the orchestra, and the actors played on an elevated stage, was first called in question by Höpken on grounds deduced from the drama itself.[285] But no one has contested that the oldest greek theatres consisted of but two parts, the place for dancing and the space for the audience, this arrangement never being abandoned from the satyr-plays (saturnalia), and that the logeion was a later addition for the actors. It is likewise not contested that the scene was originally constructed of wood with decorations of cloth, later erected in stone as a permanent decoration.

Note 285. See Höpken. De theatro attico saeculi a Ch.quinti etc. 1884

The results of further researches and studies have now settled, that in the Grecian theatre before the Roman period, there existed no logeion and no elevated stage, and therefore there was no separation between the places of the chorus and of the actors. Concerning this, it is said that Vitruvius drew a correct ground plan according to the lines, but he is erroneously interpreted, for he himself regards the area v v′ w w′ in Fig. 228 as a raised stage and v v′ as its front wall, while v v′ is the ornamental wall placed before the stage-building, or the proscenion.

The actors' booths first marked the position of the backgr-

ground of the play; the booths were later concealed by a wall of boards, and this was furnished with a door, through which the actors entered and retired, whereby the booths became the "scene" and their decoration the "proscenion", i.e., that which lies before the booths (tents). From this plan grew the later
320 stone stage-buildings, "a solid structure with a simple facade toward the orchestra, before which was placed the movable decoration."

The movable temporary decoration was followed by the stone proscenion, adorned by columns, which was built before the stage-building (see 4ycurgus' Theatre of Dionysos in Athens, 330 B.C., the Theatre of Polycleitosi in Epidauros, middle of 4 th century B.C., as well as those in Megalopolis, Oropos, and in Assos).

The cothurnus preceded the elevated logeion, "which gave the actors a movable platform beneath the feet, that permitted freedom of movement to them, but already raised them above the chorus surrounding them." The technical investigations at the Theatre of Dionysos in Athens (1886) have meanwhile settled, that a permanent scene-building did not exist previous to the era of Lycurgus.[286]

Note 286. On the Greek Theatre, see Baumeister, vol. 3, p. 1730 to 1750; also what is herein later stated under 2 and 3 concerning the Theatres in Epidauros and Oropos.

2). Monuments.

249. The Monuments.

Many ancient theatres have been preserved to us in notable remains, and some of the more important will be mentioned.

1. The Theatre of Dionysos in Athens, located on the south slope of the Acropolis was perhaps begun even 500 B.C, but was only completed by the orator Lycurgus during the years after the
321 Battle of Cheronea (338 B.C.). Rebuilt repeatedly, it received a last restoration under the archon Phaedros in the 3 d century A.D.; the scene-building and the orchestra therefore no longer retain their original form.

The concentric passage was reached by the stairways and directly from the road to the Acropolis. The step seats of Poros stone rest partly on the natural earth and partly on masonry foundations, the uppermost beingc cut in the solid rock. The lowest broader

step bore aornamental seats of Pentelican marble, that are in great part preserved, and were originally 67 in number. The magnificent chair in the centre for the priest of Dionysos is very interesting and beautiful(Fig. 227), as well as the figure reliefs on the front wall of the hyposcenion.

The orchestra exceeds the semicircular form in accordance with the rules of Vitruvius, and is separated from the rows of seats by a marble parapet wall 3.61 ft. high, but this was added only during the Roman period. A chancel extending around before this was covered by Poros slabs, and in some places by
322 perforated marble slabs, and was bordered by a parapet wall. The pavement of the orchestra is laid with marble slabs in different colors with a lozenge pattern in the centre in Pentelican, Hymettic, and reddish marbles, in which geometrical drawings are incised. The remains of the stage-building belong to diffenent periods. The reduced thickness of certain parts of its walls permit the assumption of a wooden stage-building in the period of the 5 th century.

The location of the Theatre was already known early; but the excavations of Strack (March 22, 1862) afforded the first opportunity for completely laying it bare.[288] The excavations carried on in 1886 revealed an earlier plan beneath the building of Lycurgus, that permitted the conjecture of an annular place for dancing and allowed the true form of the scene-building of Lycurgus to be recognized. This chiefly consisted of a long rectangular structure with two projections, which included the front wall of the stage-building between them.

2. The Theatre in Epidauros, with its magnificent seats of light sparkling limestone by Polycleitos, was built about the middle of the 4 th century B.C., and is for the greater part well preserved. The interior was long overgrown by bushes and shrubs, but it was cleared in very recent years, the orchestra and scene with the adjacent structurad parts were laid bare, so that the Theatre appears as one of the finest of the Grecian period. Following the slope of the mountain, the area for the spectators is built thereon and extends towards the north. The curved line of the lowest row of seats is drawn from three centres; the successive rows of seats are parallel to this, and

therefore are concentric. Up to the first diazoma, these are divided into 12 wedge-shaped sections by 13 narrow flights of steps, while 22 sections between 23 stairways remain in the upper tier (Fig. 228). A wider concentric passage is placed in the interior of the theatre close to the enclosing wall.

Note 288. See Ziller & Julius. Aufnahmen und Beschreibung des Theaters. Zeit.f.Bild. Künste, 1878. p.193, 236. Also Praktika, 1879.

The orchestra is of complete circular form, this shape being fixed by a ring of slabs on the same level with the orchestra. Around one half of this extends a slightly sunken channel with discharge openings, which open into a subterranean sewer (B in Fig. 228). The stage-building consists of a long rectangular structure divided into 5 rooms, before which was later placed a parmanent proscenion decorated by Ionic half columns. A narrow hall D was thus inserted between this and the front wall of the ancient stage-building. On both sides, narrow ramp-like passages E led to the stage-building, to the proscenion, or the narrow corridor between proscenion and scene. The proscenion wall has from the sillto the upper angle of the cornice a height of about 12 Grecian feet (= 11.64 ft.). But this is the maximum, which Vitruvius declares permissible for the height of the logeion! Hence an "excessive height" cannot be attributed to this wall, considered as the front wall of the logeion, as it is; but the acting space of the logeion indeed proves to be too shallow, if the front wall of the scene-building is assumed to be the rear wall of the logeion.[289]

Note 289. Also see Praktika, 1884. p.46-48; pls.A,B*.*

3. But at the Theatre in Oropos was found a similar front[290] wall, that has only a height of 8.23 ft (Fig.229). The wall is likewise there adorned by half columns(8 in number and of the Doric order), which are wrought in the same blocks with pilasters, which have at their backs rebates for receiving closing slabs. While the central intercolumniation remains
323 open as a doorway, the others were filled by "pinakes" (panels ?). The height of the wall from the sill to the upper angle of the cornice was 8.23 ft., and is therefore less than at

Epidauros. On the architrave over the colonnade is the inscription:-- (See the original text) by which this wall is designated as the proscenion. The assumption that this was the rear wall behind the actors seems certainly doubtful on account of the small height; but the dimensions of the orchestra also here is only 40.67 ft. to the outer edge of the circle, while it measures 78672 ft. in Epidauros, and the space for acting was for a logeion only 6.33 ft. wide, if the scene wall was made high.[291] (Fig. 120).

Note 191. Facsimile reproduction from Praktika, 1886, pl.3.

324 Moreover according to Vitruvius' rule (Fig. 231), neither in Epidauros nor in Oropos would the depth of the logeion be greater than is the sase in both examples in question, if the low wall adorned by columns be regarded as the front wall of the logeion, and the front wall of the scene-building as its rear wall, the superscription in Oropos being considered a subscription. But the small height of somewhat more than 8 Greek feet for the proscenion wall always remains doubtful! It certainly might have been carried higher by woodwork and cloth, so that it may have merley served as the base of a painted landscape decoration above it. Front walls of logeions supported or decorated by columns occur in different paintings on vases.[292]

Note 292. A collection of such in Baumeister, vol. 3, pp. 1753, 1754.

4. The theatre in Argos is irregular in form and is cut in the solid bluish-gray limestone rock; 4 "kerkides" are still to be seen, and 50 and 60 seat steps may still be counted upwards.

5. The Theatre in Megalopolis. According to the publications of E. A. Gardner, W. Loring, G. C. Richards, and W. F. Woodhouse[293], 6 steps led up to the substructure of the scene, 5.74 ft. high, these having over 11.4 ins. rise and are not to be regarded as steps for passage without further evidence (Fig. 232). They extended around the front longer side and both ends of the unusually deep (17.88 ft.) scene.

Note 293. Jour. of Hellen. Studies. Vol. 2 (1890), pp.294-8.

Examining then the ground-plan published by the investigators mentioned, the front wall of the scene is then placed exactly

where Vitruvius requires its rear wall to be. Nevertheless according to an inscription found there, the steps must have been built in the 4 the century. Further publications on these English discoveries are in prospect, which cast doubts on the new views of Dörpfeld and Reisch on the scene of the Greek theatre, for a certain period.

Meanwhile Dörpfeld has settled, that beneath the wall with the doors remain certain earlier foundations, the piers, that apparently must belong to the original structure, so that the wall with its doorways can only have been erected during a rebuilding of the theatre. According to Dörpfeld, the podium before the wall had but two steps, and three others were only added when the orchestra was lowered, these being readily distinguished from each other. A further proof of this is that the seats of honor stand no longer in their original position. The front projection was not a free podium, but rather formed the stylobate of a portico.

The front of the scene therefore was in the Greek period a facade about 26.24 ft. high, adorned by 14 Doric columns, having originally 2 and later 5 steps. That the actors appeared before this colonnade and not on its top is self-evident: it formed the back-ground for the play, "which, if the purpose of the piece exceptionally required it, could be concealed by a decoration or proscenion placed before it." Since the termination of the excavations, an English architect is preparing an accurate plan of the theatre in question,[294] that should make possible a correct decision in the matter.

Note 294. See Mitt.d.kais.Deutschen Arch. Inst. Athen. Abth. Vol. 16. Berlin. 1891. pp.256-9.

6. Of the Theatre in Magnesia on the Meander, excavated by F. Hiller von Gartringen at his own expense, the scene-building, the entrances to the theatre, the greatest part of the orchestra, and a portion of the audience room, are exposed. Three building periods may be recognized therein, an ancient Grecian, a Hellenistic, and a late Roman. The earliest scene-building consists of five rooms lying beside each other, like the later excavated theatre next following.

325 7. The Theatre in Eretria, with which it has another arrange-

arrangement in common; a subterranean passage from the scene-building to the orchestra, beautifully constructed of ashlars. Dörpfeld desires to recognize in this an arrangement for the sudden appearance and disappearance of an actor in the midst of the orchestra. Humann has drawn an accurate plan of the Theatre in Magnesia.[295]

Note 295. See Mitt.d.Kais.Deutschen Arch. Inst. Athen. Abt. vol. 16. Berlin. 1891. pp.264-266.

8. For the Grecian Theatre in Piraeus, which accommodated 2000 spectators and had much in arrangement, dimensions, and construction, allied to the Theatre in Egesta, see the source mentioned below.[296]

Note 296. Karten von Attika. Pub. by E. Curtius and J. A. Kaupert. Berlin. 1881. pp.66-67. With sketches and explanations by Borrmann in Note 42.

9. The Theatre in Mantinea was built on the plain, and an artificial hill was erected to raise the steps, which was again retained by walls of large polygonal stones. This plan required external flights of steps to the upper rows of seats, as also proved by the excavations. The seats surrounded the orchestra in somewhat more than a maximum semicircle of 109.88 ft. diameter. The seats themselves were partly made of limestone and partly of white marble. The external enclosing line of the theatre had a different centre from the orchestra, which had a diameter of 35.59 ft.

The hyposcenion was arranged in an irregular and peculiar way, and it is now settled to have been a limestone wall 2 courses high and 69.11 ft. long. On the front wall next the public were still found the marks of the location of 16 columns, and a gap at the centre for the doorway 4.92 ft. wide connected the orchestra with the space beneath the logeion.[297]

Note 297. Bull. d.Corres.Hellen. 1890, p.248, pl.17.

The well known and likewise low colonnade was set on the same plane as the orchestra. This was also the case in the Theatre in Epidauros and in the Sanctuary of Amphiaros near Oropos.

10. The Theatre in Egesta. The first range with 20 seat steps was divided into 7 kerkides and is still well preserved, as well as the front wall and a portion of the upper surrounding

wall. It is remarkable that the 20 rows of seats, being here those below the concentric passage, were furnished with backs. The stage-building is still indicated by courses of stones on the substructure. The diameter of the Theatre is 198.64 ft., and the diameter of the orchestra is 54.12 ft.

11. The Theatre in Syracuse, built between 480 and 406 B.C, was divided into 9 kerkides; two concentric passages intersected the audience space; 46 rows of seats are now certain; 15 others are assumed to complete the entire height of the theatre. the diameter of the theatre is 492 ft., and it is counted among the largest of the Grecian world.

12. The Theatre in Catania. Only the foundation walls are of Greek origin; on these rest the ruins of the Roman theatre, now chiefly above ground; it had a diameter of 316.52 ft, two concentric passages and 9 kerkides.

13. The Theatre in Akrai was small, dates from the late Greek period, and had 12 rows of seats and room for about 600 spectators.

14. The Theatre in Tauromenion, cut in the rock in semicircular form, was of Greek origin, but was rebuilt in the period of Roman supremacy. The proscenion is narrow, according to the Grecian custom; under this is a vaulted drain. It is the best preserved after that at Aspendos. The greatest diameter is 357.52 ft., that of the orchestra is 129.28 ft.; the audience space was divided into 9 kerkides.

The theatres in Asia Minor mostly belong to a later period but are better preserved, especially the stage-building, although these were nearly all rebuilt under Roman influence. One of the most remarkable is:--

15. The Theatre in Myra. It was built of white limestone, as beautiful and hard as marble, had 27 rows of seats in the first range and 20 in the second, the scene was decorated by granite columns of the Composite order.

16. The Theatre in Aizani was 183.68 ft. in diameter and it was built of white marble; the first range with 16 seat steps is still well preserved. Along the concentric passage are placed in pairs singular niches in the substructure, the surface of each consisting of a single block of white marble. The walls of the scene-building still remain and are of great blocks of limestone,

faced with marble slabs. (Fig. 225).

326. 17. The Theatre in Cyzicos had a diameter of 328. ft. and it was built of rough masonry with marble facing, on the slope of a hill. Only 2 or 3 marble steps are still in place; the scene building has disappeared.

18. The Theatre in Iassos, of the 5 th or 4 th century B.C., has a diameter of 246 ft. The seat steps are of white marble, are decorated by lions' paws, and almost all are still in place. (Fig. 224).

19. The Theatre in Telmissos is one of the largest in Asia; there is none in Europe so well preserved and in so good a style. With the exception of the scene-building, the interior still remains complete; 28 seat steps are still in place. The date of its erection falls in the period of the last Grecian kings (Fig. 224).

20. The Theatre in Patara originated in the era of Hadrian and was built with the greatest lavishness in material; the scene building is best preserved. It has two ranges of 15 steps each. According to a long Greek inscription found on the east side, its construction is due to Velia, daughter of Q.Titianus, whose father had it built. (See Fig. 223).

21. The Theatre in Antiphellos is still well preserved in its audience space; 26 seat steps are still in place; the stage exists no longer, and it indeed may well have been of wood, since no vestiges of its remains are to be found.

22. The Theatre in Perga likewise belongs to the largest and most beautiful, dating from the era of Trajan or of Hadrian. It was built of gray marble and still has 40 seat steps recessed under like consoles; the facade of the proscenion still exists and is ornamented by 5 great niches, 32.8 and 36.08 ft. high; the columns between these are of red veined breccia.

23. The Theatre in Aspendos, of the era of Lucius Verus or of Marcus Aurelius, built by the Grecian city architect Zeno and dedicated to "the gods of the fatherland and to the imperial house", according to an inscription, is the one best preserved. It has in two ranges 21 and 19 seat steps and is enclosed at top by an arcade of 53 arches (Figs. 233, 234).

327 The vestiges of the roofing over the scene are still visible.
328 The theatre is built of great blocks of breccia, set without

mortar; the jambs and lintels of the doorways and all internal decorations are of white marble. The entire length behind the scene is occupied by a great hall for actors, above which are two galleries; the floors were of wood and no longer exist. At both ends of the hall are two stairways, that led to the roof and to rooms ornamented by paintings, that were perhaps intended for authors and the director.

The ruins of the following Theatres are further notable. In Stratonikeia, Laodiceia, on the island of Kisthene, in Sparta, Megalopolis, on Delos, on Melos, in Sicyon, in Pessinus[299], in Thoricos, Alabanda, Gnidos, Tyndaris, Scythopolis, Side, Pergamon, etc.[300].

Note 299. On the Theatres in Sillyon, Perge, and Aspendos, see Niemann & Petersen. Städte Pamphyliens and Pisidiens. Vol. 1. Vienna. 1890. pp.51, 70, 102, 147; pls. 14, 20-27, 29, especially the fine restoration of the stage building of Aspendos by G. Niemann on pl. 27.

Note 300. On the Theatre in Pergamon, see; Dritte vorläufiger Bericht über die Ergebnisse der Ausgrabungen von Pergamon etc. Berlin. 1888. p.40 et seq. A copious list of the ruins of antique theatres is to be found in Muller, Bühnen-Alterthümer, pp 4-14.

b. Odeions, Stadions, Hippodromes.

Allied to the Theatre, both in purpose as well as in the stepped arrangement and construction of the auditorium, are the Odeion, serving both for use and for the exhibition of public dramas, the Stadium, and the Hippodrome.

1). Odeion.

280. Purpose and Design.

No Odeion, as a permanent structure, appears to date further back than the era of Pericles, at least in Athens. According to Plutarch (Perikles 13), "it had in accordance with its internal arrangement many seats and numerous columns. The roof was steeply inclined and terminated in a single apex. The whole must have been a representation and imitation of the Tent of the Persian Kings. Pericles likewise had supreme control here."

"There comes Zeus with sea-onion head, Pericles
And bears the Odeion high upon his brow."

Kratin. Thrak.

"To earn honor thereby, Pericles now for the first time caused the introduction of a musical contest at the Panathenian (festival), and himself as a chosen judge of the prize, arranged how the different parts should be performed on the flute, by song, or on the lute. And as then, the Odeion also later continued to be the place for musical contests."

It was burned during the war with Mithridates, but was rebuilt again by King Ariobarzanes II (65-52 B.C.); it is now gone from the site without a vestige.

The statements of Plutarch agree with those of Vitruvius concerning the form of the structure; columns of stone, and over it a wooden roof, of the masts and yards of ships from the Persian booty (Book V, Chap.9).

Pausanias (Book 1, 20) confirms the statements of both; "Near the Sanctuary of Dionysos and the Theatre is a building, that must be an imitation of the Tent of Xerxes. But it was built a second time, for the earlier one was burned by Sulla, when he conquered Athens."

Although the statements of the purpose of the structure are entirely clear and undoubted, the defective remarks on the
329 form of the building leave great opportunity for the play of the imagination. Yet we find allied designs of a later time preserved, which may supply a representation and data for the restoration of the earlier ones.

Philostratus (Vitae Sophistarum II, 5) states that Herodes Atticus built a "theatre" for the Athenians in honor of Regilla, whose ceiling was made of cedar wood; which was likewise remarkable in sculptured work, i.e., on which wood was excellent carving, a structure, whose like was not to be found elsewhere in the Roman empire. He also built for the Corinthians the "covered theatre", indeed much inferior to the Athenian, "but which still was one of the few, elsewhere remarkable."

251. Odeion in Athens.

The structure in Athens (160-170 A.D) remains in its principal parts; indeed the name of Odeion was not always applied to it (but Theatre or covered Theatre, see above); but it must have been used in accordance with the directions of Pericles.

The plan is allied to that of the great Theatre; the aud-

audience space is constructed in steps in semicircular form, divided in sections by narrow stairways and separated by a diazoma. The orchestra was somewhat larger than a semicircle, but contained no altar, according to all writers; the stage, five steps higher than the orchestra, was separated from the audience space by the paradoi and originally had a richly arranged monumental architecture with the usual three doors. Behind the stage wall was further a great vaulted hall, right and left of which rooms and staircases extended through three stories. 801

Note 801. See restoration by Zuckermann in Baumeister, vol. 3, p.1745.

The entire building was constructed of massive ashlars; the outer walls with great round-arched openings still remain, as well as the stage and the lower portion of the rows of marble seats, and also the pavement of the orchestra, with its white and pale green marble (cipolline) tiles.

The room could hold about 6000 spectators; covering it with wooden construction for a theatre about 258 ft. diameter must have been difficult, and it was only accomplished by leaving open a part as a skylight, which could itself be covered, so that the clear span was reduced, or vertical supports may have been arranged on the diazoma, as at the Theatre in Pessinus (See Fig. 287) and at Syracuse (vestiges of the columns of the roof on the middle diazoma).

Besides the skylight, when such existed, the interior received light also through a high side light, by a row of round windows in the semicircular external wall.

252. Other Odeions.

The remains of such odeions still remain in Akrai (Sicily) beside the large Theatre, in Aperia (Asia Minor) in the vicinity of the Acropolis, and in Pompeii, as well as elsewhere. The rear wall and rows of seats are cut in the rock in Aperia; the orchestra had a diameter of 19.02 ft., around this being only 6 rows of seats upwards. The most important cities must indeed in time have been adorned by such odeions, which were also used in the late period for the sittings of courts and assemblies of the people.

As the largest in all Greece after that in Athens, Pausan-
330 ias (VII, 20) mentions that in Patara. The former was not specified by him in his description of Athens, but was added in the Book "Achaia", "since Herodes had not then commenced the structure, that surpassed all others in magnitude and beauty".

2). Stadion.

253. Purpose and Design.

The Stadion was the course intended for racing contests, long and narrow, semicircular at one end, rectangular at the other. There were stepped seats for the spectators along the long sides and around the semicircular end, as in the theatres and odeions. The judges of the contest occupied special places between these, opposite to which in Olympia was erected a marble altar of Demeter, from whose steps a priestess of the goddess looked upon the contests (See Pausanias, VI, 20).

The appleation "Stadion" for the race course must have been derived from the most famous one in Olmypia, which was exactly a stadion = 600 Greek (Olympian) ft. in length, and indeed served as a model in plan and arrangement for all others.

The rounded portion (sphendone) was not used for races; the course extended only as far as the straight side; projecting antae (schenes) at the beginning of the sphendone, or shafts of columns set between the parapet walls (Stadion in Athens), marked the end. The starting place was at the square end.

A system of drains was arranged for keeping the course dry, which was covered by thin slabs and earth, and whose vestiges are still preserved in Athens. The course was separated from the spectators by a parapet wall, behind which was placed an entrance, which was 5.97 ft. wide in Athens' the public entered there to pass thence to the seats (Fig. 235). This entrance could also be drained by a masonry drain beneath it, which received and removed the rain water flowing down from the seats. The pavement of the passage was one foot lower than that of the course; the parapet wall rose 5.38 ft. above it and above a foundation wall of the same height; then followed the rows of seats, divided into sections by narrow stairways.

331 For the judges of the contest and the competitors, a sepa-

separate entrance to the course and the seats was arranged. Pausanias (Book VI, 20) designates this as the so-called covered passage in Olympia, which was likewise rediscovered by the German Expedition. For the same purpose was also the subterranean passage 12.45 ft. wide found at the Athenian stadion, which terminated within the arena of the sphendone.

As for theatres, natural slopes were also mostly chosen as locations for the stadsions, between which the course was excavated, as in Athens, to thus obtain cheaply and conveniently the substructure for the seats; or this latter was formed by simple banks of earth thrown up, as in Olympia, or entirely built of stone masonry, as in Delphi (Pausanias, X, 32), or composed partly of stone masonry, partly of natural earth slopes, as in Messene; marble seats are mentioned in Corinth, Delphi, Athens, etc. Porticos were carried along the upper row of seats in Messene and Aphrodisias; the Stadion in the latter place was semicircular at both ends, a form of plan already belonging to the late period, as well as the course in Laodiceia, which according to an inscription, was later changed into an amphitheatre. As in the theatre, the space for the audience had to accommodate the maximum number of men, while the number of the built rows of seats could nowhere be as great as in the theatre. The Stadion in Perga therefore had only 17 rows of seats, that in Aizani only 10, while Aphrodisias shows 26; Aizani seated 12, 760 men, while 50,000 found room in Athens. The dimensions of the still best preserved stadions are not very different, for those of the arena are:--

In Athens	109.4 ft. wide and	671 ft. long.
In Aizani	152.0 ft wide and	725 ft. long.
In Aphrodisias	98.4 ft. wide and	745 ft. long.
In Olympia	105.0 ft. wide and	691 ft. long.

254. Remains.

Only scanty vestiges remain of the Panathenian Stadion on the left bank of the Ilissos; the slopes, the ruins of the walls, and the cleared pavement of the arena readily permit a restoration of the whole. No more beautiful location for the purpose could have easily been chosen and utilized, than is found here. The end is placed parallel to the course of the river and was

decorated by a portico with columns or a portal, opening towards the great stone quarry lying on the longitudinal axis of the stadion, and afforded access to the public.

The first building was built by the orator Lycurgus (350 B.C.); Herodes Atticus supplied it with seats of Pentelican marble about 500 years later. At the cost of King George of Greece, the ruined portion of the sphendone was merely rebuilt by the German architect Ziller, thereby fixing the exact forms of the plan and of the details.

The most famous of Grecian stadions, that in Olympia, which seated 40,000 to 50,000 men, was uncovered by the German Expedition in 1879-81 in its most important parts. The course proved to be a long rectangle of about 702 by 105 ft., surrounded by sills of Poros stone. Around this rectangle at a distance of 3.28 ft. extended a water channel with several basins, from which fresh water could be taken during the games. The slope of the Kronion hill was utilized for the northern portion of the space for spectators; artificial embankments were necessary for the southern and others. The seats for the public were of woodwork. At each end of the course is a limestone sill, which supported wooden posts at equal distances, separating 20 starting places. The exact distance from one starting point to the other, from centres, is 630.65 ft. The eastern wall terminates the course in rectangular form, not in semicircular form with the sphendone used elsewhere. From the Altis, the Stadion has but a single direct access, near which stood the Altars of Hermes as Protector of the Contest and of the Demon of the favorable moment, to warn the contestants, "that yet all result lay in the hand of deity", and on the right of the passage rose as a warning the bronze statue of "Strafzanes". 303

Note 303. See Ausgrabungen, Ed.IV, p.50, pl.38; Ed. V, p.24, pls.35, 36; also Funde, p.21, 22.

332 3). Hippodrome.

255. Race-course and Starting-places.

The Hippodrome was the race-course for horses and chariots. Its general arrangement and form was similar to the race-course for foot-races; but length and width had to be greater, in order to have room for placing the row of horses and chariots.

Therefore the Hippodrome consisted of the level race-course (dromos), divided along the middle by a simple bank of earth into two halves of unequal length (see Pausanias), terminating at one end in semicircular form, at whose centre stood the goal, about which horses and chariots must turn. At the opposite end was the starting place for the horses (aphesis), which in Olympia had the form of the bow of a vessel, "that extends into the race-course with its prow." Each of these starting-places, in which were built the places for chariots, had a length of 400 ft.; they ended in a portico, the so-called Portico of the Agnaptos. Exactly at the middle of the prow of the vessel stood an altar of sun-dried bricks, on which sat a bronze eagle with outspread wings; before it on the vessel's prow was a bronze dolphin on a balanced beam.

When the signal for starting was given, the eagle was raised on high, so as to be visible to the assembled spectators; the dolphin was lowered to the ground. The rope stretched before the places was now dropped, so that those next the Agnaptos portico fell first; then the charioteers started, "so that those in front on the ship's prow were in line with each other. Thenceforth came the test of their own skill and of the swiftness of their horses."

A passage terminated at the longer side of the race-course, which was carried beneath the place for spectators (as in the Stadion); on this stood the Taraxippos, the Terror of Horses, in the form of a round altar, which frightened the horses. In Nemea, this, as a red stone, "that shone like fire", formed the turning point of the course.

On one goal stood a bronze statue of Hippodamia with a fillet in her hand. The adjacent conjectural plans (Fig. 236) of the Hippodrome in Olympia by Hirt and Visconti give an approximate idea of the arrangement, but do not entirely correspond to the otherwise not very coherent text of Pausanias.

The plan of the Hippodrome in Pessinus (Fig. 237), with its
333 arrangement of the race-course, the form of the starting-place, and of the spina extending along the middle is of the later period, or of Roman origin. But the connection of the Theatre and Race-course remains interesting, which may have its model

in the long terraces (Pergamon and Aegai) arranged with the Theatre.

256. Space for Spectators.

The space for spectators, composed of step-like rows of seats, as in the Stadion, and similarly divided, also laid on natural slopes or were constructed of earthen embankments (Olympia).

c. Baths, Gymnasions, and Palestras.

257. Baths.

Sea and river baths for invigoration, warm tub baths for
297 cleanliness, were already mentioned by Homer. With increasing
luxury, the custom of warm bathing became more widely extended;
bath rooms were arranged in the private houses, and "balnearia"
were built for the great public, either kept by the state or by
private speculators, in which visitors bathed together in great
basins, employing sprinklers and basins of all kinds for pour-
ing on the water, etc. Figs. 238, 239, represent these baths
after the vase paintings, one for men and the other for women,
in which sprinklers and pouring are to be recognized. A part-
ially preserved room in the Athenian Dipylon for washing the
feet still affords a vivid representation. Otherwise little
334 has become known of the architectural arrangments of Grecian
baths. That in Assos is the only larger Greek bath certain at
this time.[305] This shows as the chief apartment a portico about
16.4 ft. wide and 223 ft. long, in which stood the great basin
for water, whose bases were found. This was only intended for
washing, pouring, and sprinkling, as represented on the vase
paintings.

Note 305. According to Koldewey in Mitt. d.Kais. Deutschen Arch. Inst. Athen. Abth., vol. IX, pp.44, 46. Athens. 1884.

258. Gymnasions and Palestras.

Gymnasiums and Palestras are often of equal importance. Originally and strictly understood, the latter was the place for contests in pugilism and with the rings. The Stadion and Hippodrome being the places intended for the performance of the festival games, so were the gymnasiums places for exercises preparatory thereto; they were included among those public establishments in which Grecian youths received the chief branches of their training, the development of physical strength.

The earliest gymnasiums must be considered as simple places for exercise in the open air, shaded by groves of trees, later enclosed by walls, as Pausanias (VI, 21) describes them at Elis. There in the archaic Gymnasium in the city of Elis, where the athletes performed their exercises before they went to Olympia, was forst placed within the walls of the different race-courses, separated from each other by tall plane-trees, one intended for running, the others for competition in the five contests; also the Plethrion, where the judges of the contests paired off together those of equal age or equal skill. Adjoining these longer rooms were built smaller ones; the exercise place for competition with the rings (the Palestra proper), which, when skilled in the exercise of the rings, further exercised in fights with the softer thongs on the hands. From its form, this room was termed the "Square". Another place was likewise enclosed by walls and was called "Maltho", from its
335 soft floor; it was opened to the youths during the festival period. Two bronze statues of boys in the form of contestants in the five combats decorated the entrance to the Maltho. Altars of Hercules, of Eros, and of Demeter, were probably set in these places.

In the Gymnasion at Olympia were found places of exercise for the five combats and for running, in their vicinity being a smaller and separate room for men with the rings (Palestra), outside of the colonnade along the eastern wall, thus facing west and south, the barracks of the athletes.(Pausanias,VI,21).

259. Palestra in Olympia.

According to the excavations of the German Expedition, the Palestra in Olympia was a square Doric court with columns, 134.4 ft. along the side, surrounded by chambers and rooms like porticos, to which two columnar portals 'Prostasis) led, with two columns-in-antis of the Corinthian order. The court served for exercises and had in its northern part a peculiar pavement of grooved slabs. The columns of the hall were of the Ionic order, so that all three orders occurred in the building.

In the deep rooms toward the north is thought to be recognized the Ephebeum, and beside this the Elaothesium and the Con-

Conisterium; a room on the east was the "Frigida cavatio", from its basin for bathing. Other rooms for indeterminate purposes were furnished with stone benches.

The Palestra in Pompeii of the Oscan period may be mentioned as another example.

260. Gymnasium in Olympia.

Of the Gymnasium, only one southern portico of the Palestra, the beginning and end of the eastern portico, 690.47 ft. long, were excavated, together with the Propyleion lying between the two, in whose vicinity lie ruins of the Roman Thermae (see plan of the Altis, Fig. 132). This Gymnasium was not an enclosed building like the Palestra, but an extended place loosely surrounded by Doric porticos. The eastern portico was in two aisles, had a length of 688.8 ft., and it is regarded as a roofed stadion, used in bad weather.[306]

Note 306. See Ausgrabungen, Vol. V, p.40, pls.38-40; also Funde, I-III.

In one of the Gymnasiums in Elis was also found the council house of the Eleans, called Lalichmeion after the builder. "In the same were given free addresses and literary works of all kinds were read. Shields were hung up around it, though merely for ornament and not for warlike use." A building erected in the Gymnasium at Mantinea (Pausanias, VIII, 9) was far famed for its beautiful stones and contained a hall with statues of Antinous and paintings.

We see in the gymnasiums rooms and arrangments for intellectual and physical development combined together, equally distinguished under a roof and by magnificence. The originally simple enclosed room becomes a richly treated architectural whole by the addition of the porticos mentioned, and by the connection of the Lalichmeion.

Not much more remains of these extensive and magnificent structures of the late period for intellectual instruction and physical exercise; only ruins in Athens, Ephesus, Magnesia, Hierapolis, Alexandria-Troas, etc., still prove their existence, splendor and extent; the two best preserved ruins in Ephesus and Alexandria-Troas correspond nearly to the requirements of Vitruvius, even if they are not shaped after the same model.

336 281. Vitruvius' Plan.

According to Vitruvius, gymnasiums are "not customary in Italy;" therefore he merely gives a programme arranged according to those in Greece, and he accordingly requires colonnades around them, the courts being of square or elongated form; three of these simple, the fourth facing south or opening south, but doubled, so that the rain might not be driven into the interior; also with three colonnades were to be spacious additions (exedrae) with seats for philosophers, speakers, hearers and friends of scientific efforts; with the doubled portico in the middle was to be the hall for youth (ephebeion), a very spacious addition furnished with seats and about one-third longer than broad; on the right of this, the sack-fighting hall (korykyreion), where the sack of sand hanging from the ceiling was struck; beside it being the dusting room (conisterion), where the ring-fighters sprinkled themselves with dust after the anointing; then in the corner of the cold bath (lutron); but on the left of the ephebeion the unguent room (elatheseion), and a fresh bath adjoining this, opposite to which is the vaulted sweat bath (twice as long as broad) with its heating chamber; also a Laconic hall and opposite this the warm bath.

Externally (adjoining the rear of the complex building were described, according to Reber), Vitruvius requires three porticos, that contain places for contests; one, the northern, doubled like the southern and to be of considerable width; the two others single, so that they should have along both sides next the wall and the columns, raised footways, the central space being lower, so that the clothed spectators might find place on these footways and not be inconvenienced by the oiled contestants. The athletes could also exercise here in covered rooms during winter. Such a portico was termed a Xystos. This and the double portico were surrounded by shrubbery and promenades, adjoining these being a greater stadion with space for spectators.

337 Therefore the Vitruvian structure consisted of two adjacent portions; what was required in the first can nearly be provided in the Ephesian plan; combine therewith the Vitruvian northern and the so-called double portico with that required on the

on the south, omitting from the latter the xystus, the promenades and the stadion, then will the second portion by Vitruvius be likewise completely included within the limits of the walls (Fig.240).

The ground plan of that in Alexandria-Troas, drawn an restored by Texier (Fig. 241), exhibits simpler arrangements than Vitruvius requires and these were carried out in Ephesus. The porticos on three sides, the plan of the ephebeion, of two places for ring-fights, although different in form and size, are both similar and permit recognition of a certain allied form.

The Baths in Assos have suggested the idea, that the two types of gymnasiums of Alexandria-Troas and of Ephesus were likewise[307] baths. The plan of the former has been published by Koldewey, from new measurements, and it is given in Fig. 242 for comparison with the plan of Texier, formerly accepted as correct.

Note 307. In Mitt.d.Kais.Deutschen Arch. Inst. Athen. Abth. p. 45. Athens. 1884.

Since unguent rooms occur in the plans of gymnasiums, also cold baths, undressing rooms, etc., and washing basins were also placed in one of the large corridors, so that nearly all rooms required in baths likewise existed here, it would not be difficult to take one for the other, especially since data for
338 the arrangement of both is still so limited. Still the arrangements at Assos and Alexandria-Troas do not entirely coincide, and it is therefore believed that in the latter place other methods of bathing occurred, which were indeed somewhat more complex, but had not reached the full refinement of the Roman imperial Baths[308].

Note 308. Koldewey. p.46.

The former Gymnasiums in Ephesus and Alexandria-Troas are therefore to be considered as Baths and as intermediate between Assos and the Roman imperial Bath. This indeed seems the more credible, since a difference is scarcely to be found between the Gymnasium and the Bath, and the belief further prevails, that we must see in the imperial Bath an amalgamation of the native Italian Baths with the arrangement of the Gymnasium Palestra or the Gymnasium.

282. Extension.

No Grecian city can be conceived without a Gymnasium; larger cities indeed possessed several. With the progressive and general development of the physical exercises and the customs of the men, to take part in the games of the youths and spend therein a portion of their free time, they became a need of Grecian life.

d. Market-places, Stoas, Prytaneums, and Lerches.

1). Agora and Stoa.

283. Agora.

For the earnest business assembly of the men, served the Market or Agora. This was originally no arbitrarily chosen place in the city, but was the natural centre of the locality, "a con-
339 veniently placed depression in which different ways met." Such a market-place might under some circumstances become the nucleus of a growing district,[309] as may be observed in all modern settlements. From the scattered farms and farmsteads, men came together for purchase and exchange on a neutral ground; thus arise those stores of goods, places for refreshment, inns, shops, etc. Goods and men required protection from the weather, wind and sun; the portable, simple tents and booths became fixed huts and houses, the first era of a permanent city community. The originally scarcely fenced, leveled, and perhaps paved place, for whose consecration sanctuaries were provided, is gradually surrounded by business houses, porticos, and administrative buildings, and is adorned by monuments.

Note 309. See Curtius, E. Ueber Märkte hellenische Städte. Arch. Zeit. 1848.

The Greeks arranged their market-places in square form with spacious and doubled porticos; they decorated these by closely set columns and stone or marble beams and placed passages above the ceilings, writes Vitruvius (Book V, 1-1), and Pausanias says likewise concerning the Market in Elis, that it consisted of not combined, but of porticos intersected by streets, the southern being built in the Doric style and divided in three parts by colonnades. One of the Market-halls in Megalopolis was the "Myriopolis", another was called "Aristandreion" after its builder, and a third the "Philippic", adjoining which was a

third the "Philippic", adjoining which was a fourth and smaller one, in which were arranged six rooms for administrative purposes. In the midst of thes Market was a walled sacred precinct, before which stood a bronze statue of Apollo 12 ft. high. In Argos, the Sanctuary of Athena Salpinx, a structure of white marble, was placed on the middle of the Market; the middle in Pharae was decorated by the stone statue of a bearded Hermes; in Antikyra was a Fountain-house supported by columns. The Eleans also rode horses in their Market-place.

With increasing assemblage of people in large cities, one of the original purposes of the Market was given up and a special place was chosen for the treatment and discussion of public occasions. (Compare Athens and Megalopolis, where there was a special Council Hall, the Thersilion, that accommodated 10,000 Arcadians in an assembly.

Everywhere that a democratic state freely developed, the market-place became the scene of great activity in art. To the porticos were added aqueducts, groves of trees, as well as exhibits of art works. In cities of later origin, the earlier accidental and irregular plan of the Market-place was abandoned and this was made a part of the plan of the city in accordance with a definite scheme.

According to Pausanias (Book VI, 24), it appears to have been the Ionians, who introduced the improvement; "the Market-place in Elis is not arranged according to the same plan, as the Market-places in Ionia and the neighboring Greek cities, but in the older style."

The remains of Ionic Market-places exhibit a rectangular or square arena surrounded by porticos. Nothing longer remains of Market-places in the Grecian mother-country; in Syracuse, an unfluted column in a cultivated field marks the Agora, once so magnificent; more data are afforded by some cities in the islands and the cities of Asia Minor.

The Market-place in Aegae still appears as an extensive ashlar structure of three stories, 270.17 ft. long and 37.5 ft. wide, and with a transverse wing 88.56 ft. long. Two of the stories lay beneath the pavement of the terrace on which the building stood, while the third stood thereon as an isolated

structure. One longitudinal wall and transverse walls at distances of 14.1 ft. subdivided the lower stories into small and nearly square rooms with doors and windows, above which was placed the two-aisled portico, opening in front.[310] The comparison of this Market-place with that in Pergamon exhibits a striking concurrence of the two. A third quite similar and tolerably well preserved design of this kind at Demirdji-Deressi in Caria is published by Le Bas.[311] Fabricius[312] gives further conclusions in regard to the latter, which is usually designated as appertaining to the antique Alinda. In Aphrodisias stood four double porticos, which were internally decorated by columns of the Ionic order, 460 in number; marble seats invited one to rest.

Note 310. Compare Bohn & Schuchardt, p.15-27, Figs. 13-26.

Note 311. In Voyage Archaeoligique etc. Vol. 2. Architecture. Pls. 4, 5. Paris. 1848.

Note 312. In Bohn & Schuchardt. p.27-30.

The City Market-place and State Market-place in Pergamon lay on terraces surrounded by porticos, connected together by ramps and flights of steps.

264. Stoa.

Besides the porticos belonging to the market-places or to the theatres, others likewise occur, that have only the purpose of furnishing the people with covered and shady promenades, public walks for decorating streets or squares, also employed for consultations, addresses or readings, the Stoa, which was generally raised a few steps above the pavement of the street.

The oldest were of no great depth, enclosed on one side by a wall, with the colonnade toward the street, above which extended the horizontal entablature, like the described stoas of the temple, furnished with a stone or wooden ceiling, which was again protected by a shed roof.

Thus the Corcyrian Portico in Elis had two colonnades, one of which was turned toward the market-place, but the other was turned away from it. "In the midst between both columns do not extend (which was generally the case), but a wall, to there support the ridge of the roof." It was also covered by the gable

roof of the temple. (Compare Pausanias, VI, 24).

The Portico in Thoricos corresponded to what Pausanias held to be usual, so that this should be considered as a Stoa.

The southern Portico of the Hellanodices on the Market-place at Elis was divided in three parts by (two) colonnades; in Piraeus was a Portico with five colonnades; the Stoa of Attalos in Athens had along the rear wall a large number of small rooms for shops or money-changers, just as at the Agora in Antiphellos (compare Adler and Texier). The Stoa of Attalos was in two stories, according to Vitruvius' statements, the lower with Doric, the upper with Ionic colonnades. From the inscription on the architrave, it was founded by Attalos II of Pergamon (159-138 B.C.), and it formed a very long structure 367.36 ft. long and 63.96 ft. wide. A colonnade divided the lower story of the Portico into two aisles, while the upper was constructed in a single aisle. The lower Portico opened on the side of the Market-place and 45 Doric columns supported the upper story, while the roof rested on 22 unfluted columns decorated by bell capitals.[313] The height of the ancient balustrade north of the Stoa of Attalos is at least 19.68 ft. lower than the stylobate of this portico; the northern wall of the latter was therefore built as a high retaining wall and was always visible. Stairways must have led up to the high raised place before the Portico.[314] Pausanias also mentions such stoas in Piraeus and two porticos before the Gates in Athens extending to the Ceramicos; also in the Ceramicos itself, the Royal Portico, "where the king sat in judgement, i.e., one of the archons, who for a year was clothed with the office, which was termed kingly." For this, Lange[316] has attempted to make the form of the basilica credible, this being a three-aisled plan with raised central aisle. In reference to the Stoa in Epidauros, see the sources mentioned below,[317] and concering the Portico in Pergamon, see the work cited below.[318]

Note. 313. Compare Zeit. f.Bauw. 1882. pls.52, 53, also Fig. 243.

Note 314. Compare Mitt.d.Kais.Deutsch.Arch.Inst. Athen. Abth. Vol. 16, p.252. Athens. 1891.

Note 316. In Haus u.Halle, etc. p.66-104. Leipzig. 1885.

Note 317. Praktika. 1885. pls. 1, 3.

Note 318. Alterthümer von Pergamon, etc. Vol. II, p.40. Berlin. 1885.

Before the Portico frequently stood bronze statues of famous men and women (compare Athens); the walls in the interior were in some cases decorated by historical paintings; such a Stoa on the Athenian Market-place with such pictures was called the "gayly colored" (poikile).

One of the finest may have been that in Sparta known by the name of "Persian Portico", "which was built with Median booty, and in course of time was enlarged and beautified; on its columns stood Persians in white marble, among them the Statue of Mardonius.

The length of these porticos was usually great, as shown by the substructure of the Stoa of Eumenes between the Theatre of Dionysos and the Odeion on the southern slope of the Acropolis in Athens. The latter was over 328 ft. long; the former had a length almost twice as great.

By the excavations of the Archaeological Society in Athens in 1877, the Portico was proved to be 534.64 ft. long in two aisles and 52.48 ft. in width. A large portion of the limestone foundations of the external longer side are preserved, also the square limestone bases of the inner row of pillars and portions of the rear and side walls, around which extended below a base slab of Hymettos marble.[319]

Note 319. Compare Köhler & Zitter. Mitt.d.Kais.Deutschen Arch Inst. Athen. Abth. Vol. 3, p.147, pl.7. Athens. 1877.

In two aisles and partially in two stories is also the Portico mentioned in Epidauros, in which the free pillars in the ground story have octagonal sections with echinus-like projecting capitals to receive pillars and entablature (compare Fig. 70).

Did not these mostly Doric porticos with their long horizontal entablatures and cornices require those curves for deceiving the eye, or even in a greater degree than on the usually small temples? It is unfortunate that nothing is known concerning this, that for these structures not even the scamilli impares were recommended; to employ them would certainly be as well as on the Parthenon and Theseion, since the structural

execution of the building was probably here much less careful.

2). Buleuterion and Prytaneion.

265. Buleuterion and Prytaneion.

Data for the form of the council and official buildings serving the state administration (Bouleuterion and Prytaneion) have been obtained by the excavations in Olympia. Vitruvius devotes but few words to the Council-house (Curia); he does not discriminate between Grecian and Roman; he merely says that it should be built in entire accordance with the dignity of the city or of the free state, and he gives some advice on the acoustics of the hall for speaking.

313. The Buleuterion in Olympia consisted of two oblong halls separated in two aisles by a colonnade in the centre and ending in semicircular form toward the west. These two wings on the north and south joined a square central structure and a common vestibule of the Ionic order. Each wing rests on a crepidoma in two steps, and their ends open with 3 Doric columns between antae, whose interspaces had grilles. Separate doorways led from the aisles to the apse divided in two halves. The internal columns supporting the structure of the roof were not fluted.

On the south wing, the regulas and mutules remained without drops, and the entablatures were colored in the usual manner ((triglyphs blue, mutules blue, metopes red). On the northern building the drops are entirely wanting on the mutules, while they have an elongated form on the regulas, are made of marly limestone and inserted; only 5 drops were suspended.

In the central building, in which the Agonistes and their followers, as well as the Hellanodices, had to take the oath prescribed for them, indeed stood the Statue of "Zeus Horcheios", and this space was therefore uncovered.

The apsidal apartments are explained as treasuries, in which were kept the state funds, which were needed for the administration of the place and the festival.[320]

Note 320. Compare Ausgrabungen. Vol. 40. pls.35, 36; Vol. 5, p. 32.

Pausanias takes pleasure in mentioning them in this or that place (compare Elis, Sparta, Athens, etc.). He relates that the Council Hall in Sparta stood beside other magistracy buil-

buildings on the Market-place, and that the Gerusia or Council of the Elders met therein, while he only states in the description of Athens, that near the Council Hall of the Five Hundred (citizens chosen by lot), where each 50 men for 35 or 36 days had charge of public affairs and formed the preliminary court of the public assembly), was the so-called 'ound Building, in which the Prytanes offered sacrifice. Concerning the Council Hall in Elis, the passages relating thereto have been given in connection with the Gymnasium (Art. 260) and in those in regard to that in Megalopolis, with the Market-place. (Art.263). Pausanias states in regard to the Prytaneion, that in Olympia, it was placed within the Altis, that before its doorway stood an altar of Artemis, and in its internal apartment was a hearth, on which the fire burned continually day and night.

The Prytaneion in Olympia appears in the excavations as a spacious rectangular structure, much subdivided by masonry of different periods.

The Prytaneion was originally in each Greek city the House of the Prytanes, the chief officials, in which was the Sanctuary of Hestia, the Sacred Hearth of the State. From thence, the colonists carried the sacred fire with them to the new settlements, as a symbol of continual union. In Athens, north of the Acropolis, was for a time the seat of the government, the Laws of Solon were written in it, and Statues of Eirene (goddess of peace) and of Hestia (compare Pausanias, I, 18) were placed therein.

Here likewise occurred the public meals of the Prytanes and the distinguished citizens during their lives, in which envoys and guests of the state also participated.

347 3). Lesches.

266. Lesches.

Public buildings for the purpose of pleasant society, where neither food nor drink was supplied (like those still in the South, for example in Sicily, but only in the form of large rooms) were usual, and these were the Lesches or Conversation Halls. We may conceive them to have been built like courts or porticos, rich in architectural interiors, since the greatest artists did not disdain to adorn their interiors by paintings,

as Polygnotos did in Delphi. Pausanias devotes seven sections (25-32) of his tenth Book to the description of these paintings, evidence of the importance and prominence in which he held them. Concerning the building, he merely says, that it was founded by the Cnidians and was named "Lesche" by the Delphians, since men assembled here in old times to entertain themselves with grave matters as well as with common affairs.

That there were many such places of assembly in Greece is to be seen in Homer, where Melantho scolds Odysseus:-

"That not to sleep, thou goest into the smoky dwelling of the smith,

Or to the public house and there pratest of many things."

Such a Lesche in Sparta was called "gayly colored" on account of the paintings, the same appellation as for the painted Stoa(compare Art. 264).

Chapter 6. Houses and Tombs.

a. City House of Historic Period.

267. Development.

Just as architecture developed harmoniously and nobly during the best period in temples and state buildings, so did it take little part in the development and extension of the City House. The less interest was devoted to the latter, since the entire thought and custom of the rich and free citizens culminated in the most complete participation in public life. Political activity occupied all men, and thus no especial worth was attached to the home; it had merely to satisfy the needs of a household; most only spent time in their own houses for eating and sleeping.

While the dwelling of the prosperous, of the political leader, and of the ruler of the people, was simple, and in most cases the democratic spirit permitted no prominence of the individual in this respect, the house of the artizan and of the poor was reduced to a very small measure of architectural treatment. The streets were small and dirty, and men might even be run over by herds of swine in the side alleys of Athens, or these might be utilized after the manner of Blepyros in Aristophanes, and they were so narrow, that Hipparchos had to

lay a tax on the overhanging stories and the doors, that open-outward toward the street; thus the houses standing on them indeed also corresponded to these conditions.

345 The excavation of a small portion of the new city near the Dipylon in Athens shows us a group of small and very poor houses, placed without order and without reference to the course of a street, built of ordinary stones with earth or mortar. Less thrown together, stood the houses on the rock of Aeropagus, whose plans may still be seen by the leveling cut in the rock (Fig. 245). Neither these nor the later excavations in Megara permit a characteristic or typical form of ground plan to be recognized.[321]

Note 321. Comp. Ephemeris Arch. p.22-56; pls. 4, 5, 6. Athens 1890.

Likewise the plans of "two Houses" uncovered in Piraeus beneath the ruins of the quarter of the city on the east side of the Akte, which Fig. 246 represents, admit of finding no fixed scheme of the plan of a house. The principal facade is on the western side, where a longer street leads, which is intersected by two parallel streets, whose width is 18.04 ft. The walls are chiefly built two-faced and filled with spalls[322], and they were also externally plastered, the last coat being uniformly colored, sometimes red and veined. Thresholds do not exist or remain. The floor consists of tramped earth with small pebbles inlaid, which frequently form patterns.[323] In the northern house, a narrow passage leads directly into the court, around which
346 are grouped the rooms. The cippus shown seems to have supported a small sanctuary, and a small garden may have been placed on the terrace.[324]

Note 322. On the use of wooden courses in a wall, see notice by Dumont in Revue Arch. 1867. II. p.227.

Note 323. On plans of houses, see Koldewey, R. Neandria, etc. Berlin. 1891.

Note 324. See Maps of Attica, edited by E. Curtius and J. A. Kaupert. Explanatory Text. Hef. 1, p.56, Fig. 7 (from A. Milchhöfer). Berlin. 1881.

Concerning the peculiar plan of the House about 400 B.C., a

passage of Xenophon's Oikonomikos (Art of Housekeeping) affords some data: "(The House) is not adorned with decorations of all sorts (poikilemata, paintings, embroideries, carvings, etc.); but the rooms are built with forethought therefor, so that they might be apartments most suitable for what is to be in them, a and that they may themselves invite propriety. The sleeping room in particular, placed with due retirement, requires the most costly ornaments and furniture; the dry rooms of the house for the grain, the cold rooms for wine, the open ones for all those labors and furniture needing light. The rooms for the men to be so arranged as to afford coolness in summer, but to be warm in winter. In the general design of the house, to see that its open side be toward the south, whereby in winter it will enjoy the sun, in summer the shade(since according to Socrates, Memorabilia, III, 8,9, in houses turned toward the south, the sun shines into the porticos, while in summer it passes over the projecting roof). The women's apartment to be separated from the men's apartment by door and bolt, so that nothing may be taken out of the interior, unless authorized."[325] The architect cannot obtain much from this material!

Note 325. Compare Xenophon's Oekonomikos, translated by F. Zeising. Chap. IX, p.48-49. Stuttgart. 1866.

The evil conditions described for the entrance gave place to better in time, and according to Aristotle's Essay on the Commonwealth of Athens[326], there were as a result five police masters in the city of Athens to take care, that the scavenger contractors should not deposit garbage within a distance of 10 (?) stadia from the city wall, that none should build on the streets, or project high buildings over the street line, or carry high water-spouts toward the street, or should have the leaves of the door of his house open toward the street.

Note 326. Translated into German by G. Kaibel and A. Kiessling; 2 d edit. p.88, Strasburg. 1891. (The distance from the city wall is indeed incorrectly assumed).

The excavations on Delos in July and August, 1883, led to the discovery of the plan of a house of the epoch of the 2 d century B.C., which Pierre Paris[327] published, and which we reproduce in Fig. 247. The house had a single exit to the street and

also no vestiges of windows; for the latter always form the exception and not the rule. The rooms obtained light through the doorways from the court, whose pavement was laid in mosaic of pieces of blue and white marble, and it contained a cistern. Paris is inclined to assume the house to have been in two stories, and he extends the peristyle into the upper story, induced to do this by the great mass of ruins of the building.[328]

Note 327. In Bull.de Corr. Hellen. 1884. p.475-496, pl.21.

Note 328. Concerning a House on Delos, also see Greece, a Handbook for travelers, by K. Baedeker. Leipzig. 1888. p.147-8. (Later edition published in English).

Ross[329] expresses himself very clearly in respect to the House on Delos as follows; ---"Still worse, since more easily destroyed, is it with the private houses, of which an entire quarter of the city would still be standing, were it not for such barbarism. Their walls usually now remain for a height of two or three "shoes"; the upper portion is broken; the best stones, especially the angle stones, have been removed, and the others with the loose material form great heaps of rubbish, t that cover the ruins. Beneath this rubbish are indeed concealed many mosaic floors, and a complete plan might still be made of many ancient houses. - - -The material of these dwellings is small stones of the local slate and granite, joined with mortar, the walls are internally lined with pieces of marble (Stucco marble ?), almost as hard as stone, on which may be recognized occasional vestiges of color. In many houses are found, and partly still erect, granite columns of one to two "shoes" diameter, which have escaped the rage for destruction by their greater hardness, or by the insignificance of their material. They chiefly stand in squares of eight or twelve, and apparently formed porticos surrounding the inner courts of the houses.- ---- Beneath many houses, and perhaps under most, were arranged cisterns, partly covered by narrow arches, partly merely covered merely by long granite slabs, on which rested the pavement."

Note 329. In Ross, L. Reisen auf den Griechischen Inseln des Aegäischen Meeres. Vol. 1. p.30 et seq. Appendix to Third Letter:- Reisen und Alterthümer auf Delos und Rhenäa. Stuttgart and Tubingen. 1840.

The plan from Delos exhibits a richer architectural design of a Grecian private house, and such or a similar one was the basis indeed of the complaint of Demosthenes, that the private dwellings had become so large and the public buildings so small, while the reverse was formerly true.

The contrast between the modest ancient and the later pretentious architectural styles was afterwards emphasized by Hadrian likewise, by his inscription on the arched Gateway near the Olympeion in Athens built by him, where with a certain self-consciousness, he contrasted the new city with the homely ancient one.

The central point of the later house plan was found in the court, on which the rooms opened, receiving from it light and air.

288. Plan.

Vitruvius (VI,7) places in these or in the Grecian house near the entrance doorway a passage of moderate width, on one side of which lay the stable for the horses, and on the other were the rooms for the door-keeper, and which could be closed by a second doorway at the end. This space between the two doorways was termed dyroreion. Then followed the entrance to the court, with colonnades on three sides; on the side toward the south, the wall opened between two antae set far apart, and this room, the prostas or parastas was made about one-third less in depth than width.

348 Thence inward were arranged large halls in which the housewife sat with the wool-spinners. On the right and left of the prostadium were placed the sleeping rooms, one of which was called the Thalamos, the other the Amphithalamos. But on both sides of the porticos were arranged the dining room, sleeping rooms, and servants' rooms. This portion of the building was then termed the Women's Dwelling,(gynaikonitis). With this a spacious dwelling was then connected, with wide columnar courts, whose four colonnades were either of equal height, or that toward the south had higher columns. Such a court with three porticos of equal height and a higher one was termed "Rhodian". Next the portico towards the north lay rooms for eating and for paintings, or that next the east being the library, that next the

west being a conversation room, but a square hall next the south, which should be so large, that four dining tables could be set therein, still leaving space for service and plays. The men's banquets were held here; therefore this portion was called the Men's Dwelling (andronitis). On the right and left of it were placed small dwellings with separate entrance doorways with moderate dining rooms and sleeping rooms for guests, so that these found lodging in separate apartments and not in the columnar courts. The two columnar courts were connected at the middle by passages (metaulos and mesaulos).

Vitruvius also places the andronitis in the rear and the gynaikonitis in the front peristyle, opposed to the other tradition. A defective text indeed occurs here; that any time existed is improbable, when the two principal parts of the house interchanged places, and it is not to be harmonized with what is elsewhere stated in regard to the place of the women in the house.

349 Becker's conjectural plan in Fig. 248 therefore corrects th the errors of Vitruvius (Fig. 248 after the text of Winkler might also have originally been improved) and may serve to make clear what is said.

The great house must here be satisfied with a single entrance doorway, as in Pompeii; no portal adorned with columns gave admission, as earlier assumed for a house on Delos; this widely accepted[330] assumption has been proved erroneous by later researches.

Note 330. See Paris in Bull. de Corr. Hellen. 1884. p.474; also Tarbell, F. B. The House at Delos. Class. Rev. Vol. 3. p. 130, 131. March. 1891.

289. Internal Decoration.

Hence if the exterior of the house appears simple and plain, on the contrary, the interior was arranged with much skill and great picturesque effect; an agreeable luxury developed and architecture again produced very splendid and original things.

The courts with their porticos adorned by columns, richly decorated walls of the entrance, the surfaces of the walls of the reception and living rooms, covered with white stucco finish and painting, the panels of the ceilings with their carving

(Vitruvius, VI, 7), the doorways hung with heavy stuffs, and the floors covered by rich carpets, the elegant furniture, flowers, and netted articles, the sparkling water, splashing the the bright sunshine, the deep blue sky over the open courts, the magnificent effects of lighting, the light and shade, the attractive views and beautiful perspectives from all points, all harmonize to heighten the conception of a splendid and yet comfortable dwelling.

No hollow magnificence of facade with plain interior, as so common today, those lies overloaded with columns and caryatids, those boxes for rent, externally representing palaces, meet us here, nor in the late period; men built not for show-loving street passers, but for themselves, their families and their guests. Hence the charm appertaining to the antique house may never be stripped away, and for this reason, its chief points and attractions will recur more and more in the house architecture of all civilized races, and will also outlast us.

To avoid repetition, a thorough treatment of the late Greek house is here omitted, such as is usually attempted on the bas- of the well preserved and allied Pompeian House.[381]

Note 381. For this, see the succeeding volume of this Handbuch, p.278-291. (1 st edition).

270. Connection with the Street.

The ancient Grecian dwelling of the family was not directly connected with the street, like the low rented dwelling, a separate type of which did not exist, and which could scarcely have had any claim on architectural criticism, just as little as the great multitude of the ordinary sheltering buildings of our own time.

271. Construction.

Concerning the construction and arrangement of the house, relatively but little direct information can be given with certainty. Neither the existing structural remains nor the ancient writers afford satisfactory data in this respect.

272. Cellar.

Cellars beneath the family dwellings are everywhere proved. If the house were built on a rocky site, excavations in the rock frequently occurred instead of cellars (like such in the

vicinity of modern Athens and of Piraeus, also frequently to be found in Sicily)for storing provisions.

352. 273. External Walls.

The external walls of sundried bricks or natural stone received internally and externally a coating, which usually consisted of ordinary lime plaster; the increasing magnificence of the late period alone commenced to decorate the walls both inside and outside with paintings. Of the otherwise plain and simple House of Phocion (Plutarch, 18), it is said, that it was adorned by bronze plates (sheets); we should imagine this decoration of the House of the Commander to perhaps be similar to that on the Council Hall in Elis, where bronze shields were suspended "for ornament." (See Pausanias).

274. Doors and Windows.

The doorways (principal entrance doors) were closed by leaves of woodwork, that might be covered by bronze plates; they turned on pivots, whose sockets or marks still appear on many thresholds and lintels. The fastening was by an inner transverse bar placed by the porter and raised or even lowered from the exterior by a kind of key. The doorways in the interior were frequently hung with fabrics, as still usual in the south.

Windows are authenticated by representations on vase paintings and other works of antique art, where women looking out of the windows occasionally occur; hence they were not uncommon, but were chiefly arranged in the upper stories only, as in the houses for rent. They were closed by wooden shutters or by fabrics (Fig. 249).

275. Ceilings and Roofs.

The ceilings of the rooms were plainly made with wooden beams or were decorated by carving, color, and paneling. The roofs (simple gable roofs) were constructed of hewn timbers and covered by clay-and-straw, curved or flat tiles.

A useful attic room could scarcely be found on account of the slight inclination of the roof surfaces; in many cases, the framework of the roof alone formed the ceiling of the upper story.

276. Chimneys.

Chimneys (smoke flues) were only in kitchens; the rooms were

warmed in cool weather by charcoal braziers or by portable stoves (andraghia, pyraunoi, chaminoi), as is still the case in the South.[332]

Note 332. Compare Jahr.d.Kais.Deutschen Arh. Inst. Vol. V. p. 118. Berlin. 1890.

277. Privies.

Fixed privies must have only been first found in the late period. Quotations from Aristophanes, Demosthenes, etc., which are indeed elsewhere brought forward for their early occurrence, are uncertain and not to be used; the earliest is to be esteemed a passage of Eubulos (4 th century B.C.) in Athenaeus (p.417), where it is said, that the Thebans at least had places, that were near and arranged conveniently for certain purposes. The trustworthy Herodotus tells us of his time (Book II, 35): ---
35/ "Thus nearly all customs and uses of the Egyptians are opposed to those of other men; --- They satisfy the demands of nature in the houses; but they take their food in the streets and say concerning this, that one should do in privacy, what may be unseemly though necessary, but in public, what may not be unsightly."

278. Floors.

The floor is to be understood as being of stone, mosaic, or slabs, covered by skins or rugs during the cooler season of th the year.

279. Furniture and Utensils.

Although we must conceive the dwelling of the best period as being simple and plain in its exterior and construction, yet its furnishing and utensils must be imagined as progressively treated with the refined sense of beauty, "which has been called the inheritance of the entire Grecian race."

On vase paintings of the entire early period, we find artistically perfected and treated furniture; tables, chairs, and beds. Tables were only used at meals, there were no work tables in our sense; writing, for example, was done on the knee. Wardrobes were not usual in housekeeping; in chests or portable boxes were placed linen articles and clothing materials, and in small caskets were ornaments of gold and silver, ivory and precious stones. Many things were also kept in great

vessels of clay.

280. Vessels.

Vessels were made of wood, of burned clay, and of metal; in their treatment and execution appeared the extraordinary artistic gifts of their makers in a high degree, as shown by the many remaining cups, drinking cups, shallow drinking goblets, lamps, candelabra, mixing vases, unguent vases, and the metal mirrors of such great artistic importance.

281. Inns.

Hotels in the modern sense were unknown to classic antiquity. The enjoyments of the table and the communion in the cups were limited to the circle of friends in the house.

Public inns are mentioned in trading places and harbors, in festival and pilgrimage localities, and where the selling of wine is mentioned, these and their visitors enjoy no good repute. Very little information concerning their arrangements has become known.

The Leonidaion in Olympia 323 may be regarded as a house arranged on a better footing. The building was of rectangular plan (241.08 × 263.06 ft.), in which halls and rooms were grouped around a court 99.4 ft. square. The court was itself decorated by flower beds and water basins, these indeed being of the Roman period; the columns in the interiors were of the Doric order, while on the exterior, Ionic colonnades surrounded the building, that must have in the most magnificent way fulfilled its purpose as a hotel for guests of honor of the State of Elis, for friendly princes and statesmen.

b. Tombs.

282. Mode of Burial.

To bury the dead decently and carefully was a sacred duty in Greece. the relatives took great care that this should be done; it was strictly held, that even at least a handful of earth should be scattered over the corpse of a stranger.

The prevailing form of burial of the dead was by interment, both in the mother-country and in the colonies. Although cre-
352 mation was likewise common from a tolerably early time, it does not yet appear to have been uniform in all periods and was not everywhere usual.

283. Place of Burial.

In the earliest period, the dead were buried within their own dwellings; graves were placed in the court or garden, as shown in the plans of the oldest Athenian houses standing on the naked rock (Fig. 245). The corpses were later buried before the gates of the city in special places or preferably on the public roads; burial within the city was then, where it did not remain a custom (as in Tarentum, for example), regarded as a special privilege or a distinction.

284. Marks of Burial.

Special indications characterized the buirial places. As widely visible mounds of earth, often surrounded by circles of stones and with a memorial on the apex, were they shaped in the heroic period, as for example, the Grave of the Athenians, who fell in the Battle of Marathon was marked by a mound of earth.

In the midst of the plain of Marathon, a single conical hill, almost bare and with a few bushes, rises about 29.53 ft. high above the level land. This hill is now known as "Soros", and it is held to be the burial place of the 192 Athenians, who fell in the battle near Marathon, and it has furnished the chief grounds for locating the battle-field. But the accuracy of this assumption may be doubted, since the excavations undertaken at this place were without result. The hill was thoroughly examined at the beginning of this century, and Schliemann likewise set the spades at work here 6 years ago. (1886). In spite of these negative results, hope has not been abandoned. A systematic investigation of the hill was recently begun, and this third examining investigation led to the desired success. In the hill of about 164 ft. diameter was cut a trench 19.68 ft. wide and 85.28 ft. long, which laid bare about one-twelfth of the entire area of the base of the hill. But while the earlier excavation was not carried deep enough, this one was sunk to 9.84 ft. below the level of the surrounding plain. So much had the ground been raised in the course of centuries, as it now proved. At this depth below the present surface was found the original surface. Here was found a layer of ashes extending over the entire area of the grave, strewed with burned bones and the remains of burial vases. This find makes it undoubted, that the burial of a great number occurred here, just as might have only been after a battle.

Moreover since the burial vases provided for the dead entirely suit in their style the period preceding the Battle of Marathon, it is no longer to be doubted, that we indeed have here the grave of the 192 Athenians slain near Marathon. The layer of ashes extending over the site of the tumulus is so thick, that one may assume that a great funeral pyre was built on this place, on which the corpses of the fallen were burned. In this layer of ashes are still found branches not completely consumed by fire, but which still permit the structure of the wood to be recognized. The bones found are much injured and show the marks of burning; a great part of the vases are also burnt. Further destruction was then caused by dampness. The pressure of the earthen mound, heaped about 39.36 ft. high above the burial place, may have contributed to the fact, that scarcely a single one of the vases found has remained uninjured. About thirty vases of lecthyos form have been found up to this time, which are decorated by black figures hastily painted. If no particular marks of art are among them, this material is still of great value for the study of vases, since a fixed later point is here given for the date. A traditional monument has become a historical one by this discovery, and recalls to the present race the most heroic era of the war of ancient Greece for freedom.[884]

Note 884. From Allg.Zeit. 1890. Also Arch. Deltion. 1890. O tumbos ton Marathonomachon (Pin. D.) p.125-132.

Sepulchres also rise in form of pyramids (Cenchrae) from the ground, they are scattered over all Greece as columns and steles. With increasing luxury, they received rich figure sculptures, the originally slender form of the latter become wide heroons surrounded by columns and crowned by pediments.

353 They likewise arise as great isolated monuments, cut from the solid rock, as a high square pillar on a pedestal, or as in Lycia, are sculptured in form of a sarcophagus or as imitations of houses, artificially detached structures, like chapels or temples. Wealthy houses or families had formal sepulchres, built or cut in rocky precepices, and secured for themselves and their descendants special places as hereditary burial places.

Luxury in these matters appears to have risen to a high point.

Demetrios Phalerus, for example, had to issue a decree to limit them, and accordingly in Attica a sepulchral stele could not rise more than 3 ells above the burial mound.

285. Coffins.

The bodies of the poorer class were buried in the common burial place of their community; sepulchral columns perpetuated their names even there.

If the body of the departed could not be obtained, then an empty grave in imitation of the actual one was prepared as a memorial. For the missing one, an empty cushioned bier was borne at the burial.

The corpse was placed in the clay coffin (cherameos soros), which was constructed of burned clay in the form of a roof, and the use of which was among the Athenians regarded as a custom of their fatherland (Fig. 250). Besides the coffin of flat tiles, there were also others of curved platesa[335] Also clay chests for the dead (Fig. 251) and wooden coffins were in use. "If when the bones are carried away, then come carts with coffins of cypress wood, one for each community, and the
354 bones of each one are in the coffin of his community," writes Thucydides (II,34).

Note 335. Compare Stackelberg, O.M.V. Die Gräber der Hellenen in Bildwerken und Vasengemälden. Berlin. 1837.

But the clay coffin also takes the form of the rectangular house with gable roof and gables, the coffin thus representing among the Greeks also the house, the last dwelling of the departed. The desire to decorate it led to painting the smooth clay surfaces(Fig. 252). The earliest Grecian coffins in the form of the sarcophagus later common are the beautiful Klazomenian examples from the 6 th century, whose form is moreover not original in Greece, but was introduced.

Marble sarcophaguses with relief ornament seem to first occur in Greece about the end of the 4 th century B.C. One of the oldest and most beautiful style is a sarcophagus with the Combat of the Amazons, now in Vienna. This is even excelled by the so-called Sarcophaguses of the Macedonian Kings of the Hellenic period found in Sidon. The latter were discovered in a common sepulchre (Fig. 253), placed in a separate chamber, cut in the rock. Some of them are of the highest art value. Of

really thrilling beauty, of high dignity with wonderful invention and execution, is a sarcophagus with lamenting women, which otherwise bears no marks of painting. Its corners, in which the four surfaces of the lower part intersect, are char-
355 acterized by Ionic antae, between which stand 5 Ionic half-columns of indeed the most careful execution. In spite of the relatively small scale, no bead, no acanthus leaf, no volute band, and no flute is forgotten, all being so skilfully, easily and limpidly wrought, with such noble and elegant proportions of the columns, that nothing appears little or labored. Between the columns are smooth chests, extending to about one-third the height of the columns, before which (2 × 6 + 2 × 3) are placed
356 18 draped female figures between the columns. No position or posture is repeated and a special and interesting motive is found in each figure. With softly falling garments, bowed heads and folded hands, a figure expresses the deepest emotions of sorrow and pain, like a forerunner of the Mater Dolorosa of Renaissance art. One would almost believe himself standing before a work of the early Renaissance, so strongly, purely, and seriously are the small figures conceived. On two other marble sarcophaguses, that exhibit no sculpture on the sides, the antique roof is imitated with wonderful accuracy. No flute ornaments or acroteries are wanting here: the ridges bear palmettes; the water spouts beneath the cyma are perforated; the tiles are the most costly models of the Grecian marble roof. On others are sculptured in the tympanum of the pediment a rider with prancing horse, or scrolls of leaves and flowers with round stems, scrolled and grooved, as on the cyma of the Leonidaeon in Olympia, or on the Tholos in Epidauros. Everywhere
581 is the grace and beauty of Greek forms with high perfection in execution. The richest among the sarcophaguses belongs to the type, where the external surfaces are decorated by figure reliefs, battle or hunting scenes, as shown by the Amazon Sarcophagus in Vienna already mentioned.

But what places the Sidonian especially high above all other known examples is their architectural treatment, which cannot be conceived nobler and more characteristic. Its smooth plinth forms the base, above which extends a member, as on the walls

of the Erectheion, consisting of round, scotia between two fillets, smaller round, over this being an inverted Lesbian cyma with beaded astragal, fillet and apophyge. The mouldings are ornamented in the richest manner by interlacing heart-leaves and beads, and they form a magnificent base for the sides adorned by figures. The figures are 1.71 ft. high and are wrought in high relief, so that the feet and arms of some are entirely free from the background. The composition of the front side recalls in many ways the famous mosaic picture of the Battle of Alexander in Naples. On the left of the spectator and on a tall horse, Alexander in flowing mantle and with leveled spear charges on the Persians, fallen into confusion, while on the right side, a Macedonian general (Perdiccas ?) with morion on his head and in flowing mantle hastens into the combat with a less animated movement. Alexander wears the head covering to be seen on his coins and appears spirited and warlike, while the countenance of Perdiccas looks grave and gloomy. Wonderful is the movement of the design and wonderfully are the details executed: pain, scorn, and longing for death are remarkably expressed in the faces ; tthe bodies of the infantry, one of whom strikes the knife into the neck of a prostrate man, are finely modelled. The rearing horses have a truth and animation, which recalls a master like Lionardo. The combat extends over one end and in the same compact manner' the other side and end are decorated by just as beautiful and animated hunting scenes with equally perfect execution.

A cornice terminates the figure frieze, that consists of a heavier geison, whose front surface is ornamented by a skilf-
357 ully wrought fret pattern, and of an echinus decorated and with a pearl-bead. These simple and noble architectural members, which enclose the wild fluctuation of the battle andt the hunt, contribute by their isolation and quiet no little to make the figure composition appear even more animated. On this substructure rests the massive lid, whose vertical members meet accurately at the crowning cornice of the sarcophagus and consist of a low architrave with ogee moulding and scotia, over these being a frieze decorated by vine scrolls (grapes and vine leaves) and an Ionic geison with dentils. The latter are alternately

ornamented by ram's heads and female heads with radiating hair. On the angles of the pediments are sculptured four lions lying down, while fighting figures adorn the pediments, which are indeed rather small in scale. On the front appears a distinguished man, thrown down by soldiers, who surround him.

If this work, executed in the noblest fine-grained white marble, is exceedingly entrancing, we are further enthralled by the colors, that cover the sculptures and are in great part well preserved still. Helmets and weapons of the warriors are partly gilded, the mantles of Alexander and Perdiccas are violet purple, the hair is light brown, the eyes and lips are painted in the most careful and remarkable way' the reins and bits of the horses, the arrows sticking in the flesh of the animals, were wrought in bronze, according to the marks and vestiges, and were fixed in place, the vine scrolls of the frieze rise in gold on a ground of violet purple; the little figures of the pediments are not without color. On nude surfaces of figures, the bodies and faces, the marble is smoothed most carefully and it is further finished with a colorless wax polish. Thus the nude surfaces have the effect of a mild and no longer white brilliancy amid the gleam of the other colors, just as the human skin appears in reality. Therefore I could not subscribe to the principle stated by von Treu:[337] "I hold that a toning of the nude surfaces by mere wax is excluded;" aside from the fact, that I judge the soft or too strong rosy colored flesh tone, erroneously imputed to so many antique sculptures, to be not exactly a happy addition, and in consideration of the circumstance, that various artists have been able to treat their works differently in regard to polychromy, and much may have been a later addition. The colored figures[338] rise from a white ground and appear distinguished and not gay in their coloring. A good and likewise practical contrast with the colors of the figures is produced by the gold violet broad frieze band of the lid and by the light and shade effects of the richly sculptured base, which has the effect of a gray ornament painted on gray.[338]

Note 337. In Jarhb.d.Kais. Deutsche Arch. Inst. Vol. 4,p.24. Berlin. 1889.

Note 339. Compare Durm, J. Die Makedonischen Königssarkophage.

Cent. d. Bauw. 1890. p.329; also Revue Arch. N.S. vols. 10, 11; further, Amer. Jour. Archaeol. 1887. p.97; lastly, Die Antiken Sarkophagen-Reliefs in Auftrag d.Kais. Deutsche Arch. Inst. mit Benutzung der Vorarbeinten von F. Matz, heraus.u.bearb. von C. Robert. Vol. II. Mythologische Cyklen. Berlin. 1890.

Simple stone sepulchers, not deep below the surface, where the dead were placed between stone slabs and dry limestone masonry were in use in Chilidromia. Tumulus and pit graves in the heroic period and the placing of the corpses therein have already been treated in Arts. 29 to 34.

286. Deposits.

With the corpse were deposited copper utensils, vessels, small
358 clay figures, favorite animals, articles of clothing, ornaments, and even food (See Fig 251). "Everyone brings to his dead a gift, if he wishes." (Thucydides).

287. Rock-cut Tombs.

The tombs cut in the precipices of the valley of the Nile (see Fig. 7), with the vestibule and two columns between antae at the entrance, are recalled by the tomb-facades of Asia Minor, cut in the rock, whose employment depends on the nature of both countries, and which also suggest the grotto-tombs in Rhodes., Cyprus, in Greece, on the north coast of Africa, in Nauplia and Syracuse, on Crete, Egina, Melos and Delos.

Continuous rows of columns and piers before the sepulchral chambers, that are placed beside each other, and for which are utilized terraced inclined rocky slopes, are found in Cyrene, and also vestibules adorned by columns and pediment, as in Asia Minor.

288. Hemispheres.

Peculiar sepulchral monuments without any claim to artistic development are those originating in the 3 d or 4 th century B.C., the hemispheres of blue marble, common on the island of Kasos, which 534 have a diameter of 0.82 ft. with the name of the deceased cut on their smooth front surface.

289. Columns and Steles.

Of more artistic importance than these primitive memorials are the columns (chiones). The Grecian sepulchral memorial was developed to its greatest perfection in the Stele, i.e., a tall slab of stone set in the earth or fastened on a base, diminish-

diminished upwards and terminating with a cornice; above this, it had an anthemion cap in simpler materials and only painted, or in richer ones consisting of sculptured luxuriant acanthus ornament with scrolls and palm leaves, which belongs with the most beautiful creations of Grecian decorative sculpture.

The front surface of the slab is further usually decorated by a magnificent sunken seated figure in relief with the memorial inscription beneath and two skilfully wrought rosettes above it (Figs. 253, 254).

359 360 After the 4 th century B.C., family scenes were preferred for the reliefs. Some of these represent the departure, the husband extending his hand to his wife and saying farewell, the father to his children, the wife to her husband and children; others are entirely without reference or purpose.[389]

Note 389. Others imply by extending the hand merely a token of good wishes and friendship (Compare Comptes Rendus. 1861. p. 102).

290. Hydriae.

A hydria beside such a figure, as frequently occurs on the reliefs of these sepulchral steles, signifies in accordance with the Attic custom, that the person there buried died unmarried. For these unmarried persons, the hydria alone was adopted as a memorial, earlier in clay, later much larger and carved in marble; it might likewise be decorated by sculptures, the same scene of departure, as shown by numerous examples. (Fig. 255).

As sacred places, we find the tombs likewise ornamented by fillets and garlands; formal gardens were also arranged around them in the later period.

291. Heroa.

Heroa was the preferred name for the memorial stone shaped as a niche between antae or columns on right and left (Aedicula), between which were reliefs, and covered by entablature and pediment. (Fig. 256).

292. Statues.

Portrait statues, if permissible in the heroa, were favorites in the Alexandrine and Post-Alexandrine periods.

293. Chapel and Temple Forms.

The tombs of family heroes and kings were frequently distinguished especially; since their remains were frequently interred in the vicinity of sanctuaries or in the temples themselves, there likewise arose special tombs for them in the form of chapels and temples. Arkas, the tribal hero of Arcadia, was buried at the altar of the Temple of Hera at Mantinea, and Pyrrhos in the Temple of Demeter at Argos; Amphiaros'
361 tomb was built in the form of a temple (compare Valerius Maximus, VIII, 16), over Castor's grave in Sparta stood a sanctuary built for him.

Aside from the evidence of the writers, considerable remains of the temple-like tombs are preserved. They chiefly consist of a massive substructure, to which steps lead and which contains the sepulchre itself; over this rose in proportion to the substructure a small columnar structure with a gable roof or one in form of a stepped pyramid.

Rich figure ornament decorated the substructure as a frieze or was placed between the columns, as on the magnificent Temple-Tomb (so-called Monument of the Nereids) near Xanthos in Lycia; groups of figures crowned the apex of the pediment or the platform of a pyramid. The columns either merely support the roof, as for the monuments in Mylassa and Cirta, or they surrounded a small cella structure, as in Xanthos and Halicarnassos, or as three-quarter columns ornamented the angles of a cella, as on the Tomb of Theron at Akragas. The greatest astonishment in the ancient world was aroused by the Tomb of Mausolos in Ha-
362 licarnassos. "It was so extensive and so beautiful in execution, that even the Romans were amazed at it and from it termed their own important sepulchral monuments mausoleums." (Pausanias, VII,16)

294. Monument of the Nereids at Xanthos.

The Nereid Monument is now regarded as the Tomb of the Lycian prince or Persian satrap Pericles, who took possession of the port of Telmissos about the 102 d Olympiad. On a high substructure decorated by two figure friezes extending around above each other, rose the hieron, an Ionic peripteral structure of 4 × 6 columns with a cubic cella and entrance between antae, where to obtain space for the doorways, the Ionic columns are

crowded back close to the antae. The entablature consisted of an architrave ornamented by reliefs and a cornice with dentils. The frieze was wanting, as in Lycian facades of tombs. Around the walls of the cella extended a frieze 1.41 ft. high and high reliefs decorated the pediments with statuettes at the apexes and angles of the pediment. Four marble lions guarded the entrance to the cella, and in the intervals between the columns of the portico stood the Nereid figures, to which the monument owes its name (Fig. 257). Everything remaining of the sculptures executed in Parian marble was brought to the British Museum in London (Compare also with what was said on p. 267 of this work, German text).

295. Mausoleum at Halicarnassus.

The tomb, that the Persian satrap, King Mausolus, had placed on the soil of Asia Minor for himself and his sister-wife Artemesia, busied about the middle of the 4 th century B.C. all the most important Grecian artists of that time.(Compare Pliny, 36, 30, 31). Satyros and Pythis[240] are mentioned as architects; the sculptured ornamentation was entrusted to Scopas, Bryaxis, Timotheos and Leochares. The building still stood in good preservation in the 12 th century A.D. in the Carian port, until an earthquake partly overthrew it , and it was at last entirely destroyed by the Knights of St. John (1402 and 1522). In 1846, 49 relief slabs of the monument were found and taken to London; later in 1856, excavations under the direction of Newton brought to light numerous remains of architectural members and of sculptures.

Note 240. Compare Brunn. Vol. II, p.253, 254. (Pythis, Phythios, Phiteus, Phileos).

Pliny gives the height of the monument as 140 ft. and its perimeter as 440 ft., including the quadriga standing on the summit platform. Judging from the fragments , the statues of the building were about 8 ft. high. Portions of more than 20 marble lions were found; also the highly famed torso of a mounted amazon is to be here mentioned. The reliefs were painted and the facing slabs likewise consisted of kinds of marble of different colors.

296. Grotto Tomb of Syracuse.

On account of the great number and of their different form and construction, the Syracusan rock-cut tombs are especially remarkable. "By them we can follow the changing nature of burial from the darkness of the oldest or Sicelian period through the centuries of the Grecian period until the time of the Roman[341] rule and finally to the Christian Catacombs."

Note 341. Compare Holm-Cavallari, p.310-327.

The Grecian tombs found there appear as grotto tombs, and in them constantly occur the characteristic memorial, the sep-
363 arate receptacles for the bodies (Loculi), which may be cut in the rock, constructed of slabs, or may be sarcophaguses of terra cotta or marble. The loculi were always covered by slabs and their bottoms were sometimes perforated, to permit the escape of the fluid resulting from the decomposition of the corpse to a lower cavity. Just as characteristic are likewise the flat recesses above the loculi (compare Fig. 258), where is shown a perfectly developed sepulchral chamber of the street between the Latomia of Paradiese and St. Venera.).

An interesting example of an architecturally developed tomb is given by Fig. 259, the erroneously so-called Tomb of Archimides, a tomb chamber of moderate size, whose plan forms an irregular rectangle, and whose entrance side is decorated by Doric architecture cut from the rock at a small scale. On two half-columns rests a complete Doric entablature with architrave and triglyph-frieze with a pediment enclosed by a cyma. The front wall between the columns, in which was the entrance doorway, is now destroyed. The space in the interior served for the deposition of entire bodies or the reception of bones or ashes.(Compare the great niche on the right of the entrance for entire bodies, the five arcosolias of the rear wall and the four of the left side, behind whose fronts were preserved the remains of bodies. The holes in the floor contained bones and ordinary Roman urns).

297. Heroon of Gioibashi-Trysa.

A monument of peculiar arrangement is found in the Heroon of Gioibashi-Trysa. Walls of 12.46 to 20.99 ft. high enclose in rectangular form a terrace on the slope of the mountain (64.5

(84.5 × 80.5 × 87.9 × 77.0 ft), to which a single doorway (4.04 × 7.05 ft.) on the least side affords access. The walls are mostly coursed with trapezoidal ashlars, and the two upper courses are decorated on relief sculptures inside and outside, which are terminated by a plain crowning cornice, ornamented by an egg-and-dart moulding. The high external lintel of the doorway supports four strongly projecting winged bull's heads, the jambs on the inside each support an almost life size fig-
364 ure of a dancer in a niche; little figures of musicians ornament the lintel. In the interior stands obliquely to the wall one of the well known Lycian sarcophaguses, that imitated a wooden hut. Outside the walls stand three others, two of which have the form of the wooden hut with gable roof and widely projecting gable, the third having a pointed-arched roof. The latter is almost 16.4 ft. high, while the others have heights of 9.85 and 13.1 ft. The very interesting reliefs on the external south wall represent combats of amazons and centaurs, the war of the seven against Thebes, a landing battle; on the internal south wall are a feast, quadriga of the founder, Bellerophon, the slaughter of the suitors, and the hunt of Meleager; on the internal north wall are the robbery of Leukippides, a hunt, the combat of centaurs; on the internal west wall are the battle between the shipyard and Troy; the storming of Troy, Achilles and the amazons; on the internal east wall are combats of Antaeus, deeds of Theseus, and a feast.[542]

Note 542. Compare Benndorf & Niemann. Das Heroon Giolbashi-Trysa. Jahrb.d.Kunsth. Samml.d.Oest. Kais. 1889-91.

298. Royal Tombs at Commagene.

The Royal Tombs at Commagene are likewise peculair. Near the Tomb of Sheshank and above a subterranean sepulchral chamber, there rises a stone tumulus of about 410. ft. diameter, around which are three sculptures supported by pairs of columns, which are so placed at the foot of the hill as to mark on the plan the angles of an approximate equilateral triangle. The pairs of columns are of the Doric order of the later period, each being composed of 7 drums and resting on square plinths: they are connected by plain architraves, on which stand isolated figures. (Two eagles and one male and one female figure, seated beside each other).

Another Tomb near Kara-Kusch shows columns in threes in the same arrangement, but which are not joined by a common architrave, each separately supporting on the abacus of the capital a seated lion and a relief slab with figures (Fig. 280).

At a third tomb and at the foot of a tumulus about 458.2 ft. diameter, three terraces are built, that support figures of ancestors and of gods, built in 7 to 8 courses of stone to a height of 32.8 ft. and then sculptured; seated colossi with relief slabs, lions, and eagles alternate. The location on the high top of a mountain is common to all these tombs. The last mentioned is widely visible, being placed on the Nemrud-Dagh, 8560 ft. high.[343]

*Note 343. Compare **Humann** & Puchstein. Reisen in Kleinasien und Nordsyrien etc. Berlin. 1890.*

The tumulus of the heroic period again returns and casts its shadow on the end of Grecian art, just as on the beginning thereof!

365 Final Note.

"In few provinces of historical-philological science has in very recent times "dies diem docet" played such a part as in archaeology. The condition of quiet content, since the course of the history of antique art has been fixed in its main facts, has long existed, as well as the belief, that one may build further on secure foundations."[344] What has been given in the preceding merely represents the most important facts discovered in the time, published and tested.

*Note 344. See Blumner, H. Beilage z.Allg.Zeit.1891. **No.** 118.*

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